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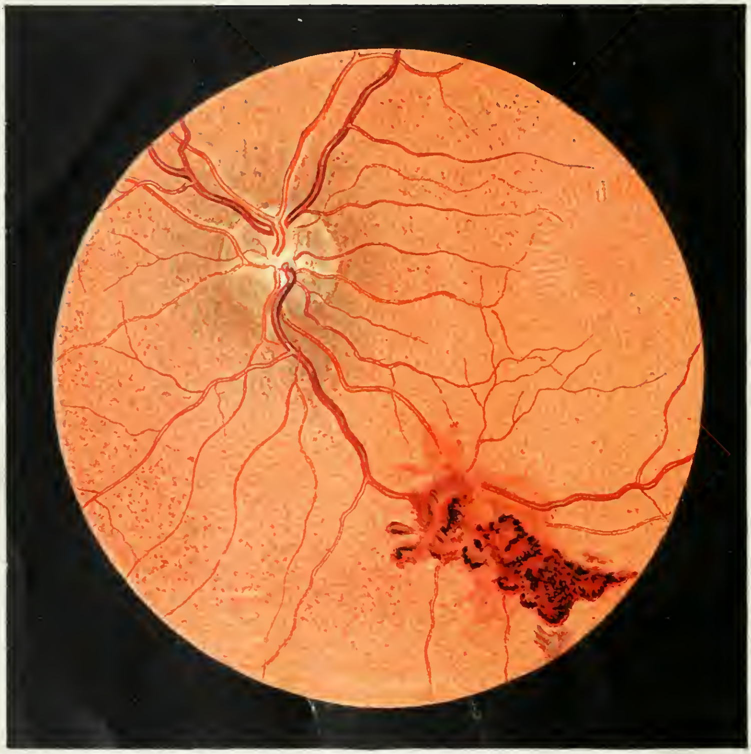

Ophthalmoscopic appearance of traumatic rupture of the inferior temporal vein.

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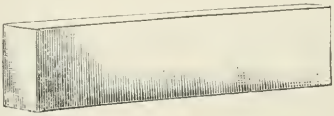
OPHTHALMOSCOPIC REPRESENTATION OF A CASE OF TRAUMATIC RUPTURE OF THE INFERIOR TEMPORAL VEIN OF THE RIGHT RETINA.*

By Charles A. Oliver, A. M., M. D.,

ONE OF THE ATTENDING SURGEONS TO THE WILLS' HOSPITAL; ONE OF THE OPHTHALMIC SURGEONS TO THE PHILADELPHIA HOSPITALS, ETC.

With Colored Frontispiece.

On the 18th of March, 1896, at 7:30 a. m., a fourteen-year-old apprentice in a machine shop was struck in the left eye with a piece of steel, the actual size of which is shown in the accompanying woodcut. The missile was thrown with but a slight degree of force by a fellow-workman, who was standing at some twenty-five meter's distance. Numerous brilliant stellate phosphenes were noticed at the time that the eye was struck. These were followed by a temporary obscuration of vision. Upon account of severe ocular pain provoked by movements of



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*Read before the 1896 meeting of the American Ophthalmological Society.

the globe, tea-leaf poultices, which gave much relief, were applied by the patient. Previous to the accident the eye was as good as its normal fellow.

Fifty hours after the accident I saw him at my clinical service at Wills' Eye Hospital. The lids of the left eye were red and swollen. There was slight tarsal and ciliary congestion and a small area of slight superficial haze in the centre of the left cornea. The pupil, which was two millimeters in diameter, was one-half a millimeter smaller than that of the other eye. Both irides, which were intact and uninjured, were equally and freely mobile to light-stimulus, accommodation and convergence. The left iris was slightly hyperemic and there was some ciliary tenderness. Intra-ocular tension in each eye was normal. Vision in the injured eye was reduced to one-fifth of normal ($\frac{5}{25}$).

The power of accommodation in the left eye was as good as its fellow (into 8 cm.), but the region of accommodation was markedly lessened (50 cm. into 30 cm. for the far-point).

The ophthalmoscope revealed an extraordinary picture, which was immediately sketched in water colors by Miss Margaretta Washington, of this city. As can be seen in the frontispiece reproduction, there was a dense, irregular subhyaloid hemorrhage, which had escaped and was, at the time of examination, escaping as a series of slow oozes, seemingly independent of cardiac action, from a rupture in the inferior temporal vein at an upward angle just beyond its inferior bifurcation. The blood was disposed in irregularly situated clots and layers, the densest massings being those which were furthest down and out. In the macular region there was a stellate and irregularly shaped area, enclosing the fovea centralis at its lower inner part. This area was similar to that which at times is seen in cases where there have been slight though rapidly-given contusions to the eyeball by blunt instruments. No other gross change in the eyeground could be determined.

The fields of vision, beside evidencing an absolute scotoma for both form and color that coincided in relative position with the hemorrhagic extravasation, was concentrically contracted to about one-half of its normal size.

No family or personal history of hemophilia or any dyscrasia could be obtained. The patient was strong and vigorous for his age, and had always been healthy and sturdy.

Atropine was used locally, the emunctories were freely opened, and alteratives were given.

In seven days' time vision had risen to $\frac{5}{15}$. The pupil was two-thirds and evenly dilated and the ciliary tenderness had disappeared. The atropine was graduelly reduced in strength and frequency until one month had elapsed, when hardly any traces of the break in the venous wall and the resultant hemorrhage remained. At this visit all medication was ordered to be stopped.

At present writing, nearly nine months later, vision has risen to full acuity, the same as that with the fellow eye, and accommodative power is normal. All signs of inflammation in the anterior segment of the globe have disappeared. The visual fields carefully taken by one of my assistants, Dr. William C. Krauss, fail to give evidence of any scotoma in the left eye except possibly a doubtful lessening of saturation of color in the position previously occupied by the absolute blind area. The extent of the left fields, however, as compared with those of the right eye, still manifest a slight concentric reduction. The ophthalmoscope shows that the subhyaloid extravasation has gone. The vessel-wall in this situation seems thicker and irregularly opaque. The underlying retinal tissue is dragged into a series of striæ, which runs mostly at an angle of seventy-five degrees. In other words, with the exception of these almost indiscernible sequelæ, the eye is as perfect as its normal fellow.

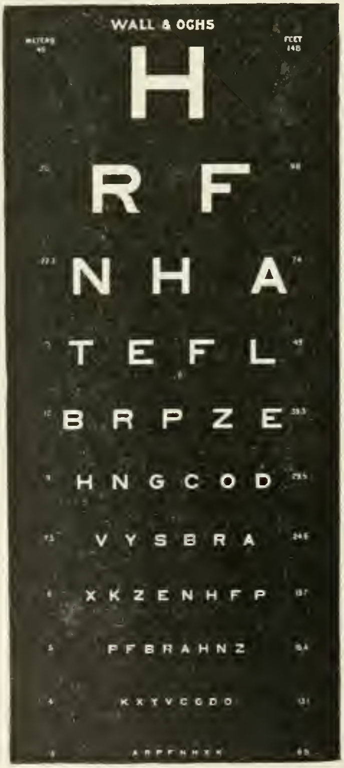
TEST CARDS WITH BLACK BACKGROUND AND WHITE LETTERS.

By George M. Gould, M. D.,

PHILADELPHIA, PA.

Illustrated.

Having often noticed the frequency with which patients become fatigued in the subjective tests for ametropia, it has occurred to me that this weariness might in a great measure be due to the excessive stimulation of so large a portion of the retina by the white backgrounds of the test cards. By physiologists it will at once be recognized



that our entire system of education, so far as concerns reading and writing, is based upon a necessary but still a false physiologic principle. White surfaces reflect all or the larger part of the light thrown upon them, and this light stimulates the retinal elements upon which it falls. Conversely black surfaces absorb the light, and consequently rest the retina. This is in accordance with well-known physical and physiologic laws, and needs no further comment. In the ordinary white background of books, writing paper, and test cards, we therefore positively stimulate a relatively large portion of the retina, leaving, as it were, small portions of nonstimulated or black parts corresponding to the black letters. Physiologically this is the reverse of what should take place. The positively stimulated portions should be by the letters, the enormously larger part should be black and unstimulated. In this way we would undoubtedly save much ocular labor and weariness. Unfortunately it is practically impossible to carry this out in ordinary writing and printing.

Fortunately, however, it can be done in our test cards. In testing eyes under a mydriatic the great advantage of the method at once becomes strikingly apparent. The iris being paralyzed, the eye cannot protect itself as it is able to do in a normal condition, and every oculist will agree with me, I think, that the tiring of the eyes of our patients during the tests is a fact that often occurs, and that not only delays us in our work, but sometimes makes the tests inexact. In amblyopic, strained and asthenopic eyes the fact is especially frequent and troublesome. Occasionally such patients are unable to go on with the tests without resting, and complaint, either at the time or afterward.

There are other optical reasons, which will not be given here, why I think the white letters on a black blackground are greatly preferable. To amblyopic patients these letters stand out more sharply, and lose the irradiation of the black letters. This lack of penumbra or radiation is proved by the fact that the same eyes read a line or two lower on the black cards than on the white. The mydriaticized eye is almost always an artificially amblyopic eye, until the testing is complete.

The great advantage of the present suggestion is the restfulness felt by the patient. Hang a blackground card by the side of the old white ones and even to the normal eye the difference is striking. Patients speak of it spontaneously, expressing themselves with decision in favor of the black card with white letters.

I have asked the opticians, Messrs. Wall & Ochs, of Philadelphia, to print a number of their cards in the way described, for ophthalmologists who may wish to try them. I use them exclusively and am much pleased with the results.

[POSTSCRIPT.]

Since working out this conclusion and using the cards in my office, I have learned that such black-grounded, white-lettered cards were suggested and tried some twenty years ago, but seem to have fallen into disuse, probably owing to the difficulty of manufacture. The able article by Dr. Frederick K. Smith (*The Refractionist*, Oct., 1896) does not even mention them. I may add that it is very difficult to make the black background of the cards a perfect and "dead" black, and especially is it necessary in these cards to have no cross-lights in the illumination of them, while it is still more important that the cards be suspended at such an angle with the light and the patient's axis of vision as shall avoid all reflection of the sheen from the card into the eyes. A little testing and experiment well determine the proper angle. If this reflection is not obviated, the effect of the letters is as unendurable as when, properly placed, it is pleasant and grateful to the eye. The cards should be unframed and hung upon a large dead black velvet or other cloth (or painted) surface. The least reflection from adjacent furniture or apparatus near by becomes noticeable with these cards that, with the white cards, was drowned by their shock of brilliant white.

A PECULIAR CASE OF SARCOMA OF THE CHOROID.

By G. Griffin Lewis, M. D.,

SYRACUSE, N. Y.

Mr. H. C. D., age 59, white, married, first consulted me on June 15, 1896, complaining of an inability to see with his right eye. He gave the following history: Four months previous he noticed a blurring of the vision in his right eye, which gradually increased but was accompanied by no other symptoms except a slightly dull, aching pain in the right temple, which was of an intermittent character. His family history was good, and he had never been sick a day in his life, with the exception of an occasional cold, until three years previous, when, according to his son, who was the attending physician at the time, he suffered from valvular insufficiency of the heart, the action of which has ever since been more or less irregular and changeable.

I also learned from the patient that just after recovering from this sickness, while running to a fire one evening, one of the conjunctival vessels of the right eye ruptured, producing considerable ecchymosis.

The tension of the eye balls was normal, the pupillary reflex normal in both eyes and his urine normal, but his arteries were atheromatous. Examination of the right eye revealed a posterior polar cataract, which was so far advanced that a view of the fundus with the ophthalmoscope was impossible, and the vision in that eye was entirely gone with the exception of an ability to distinguish shadows from below. He was also unable to recognize reflected light when thrown into the eye from various directions, excepting when coming from below, a fact which plainly indicated that some pathological process had taken place within the fundus.

Taking into consideration the condition of the patient's heart and arteries, and remembering his statement regarding the conjunctival hemorrhage, which was, in all probability, due merely to the exertion of running, I diagnosed the case as one of intra-ocular hemorrhage following cataract.

The cataract was of rapid development and was no doubt due to mal-nutrition of the lens, caused by some pathological process within the same eye, as the lens of the fellow eye was perfectly normal, and the intra-ocular hemorrhage evidently did not take place until after the cataract was sufficiently mature to shut off the vision, as there was no sudden but a gradual loss of sight.

The vision of his left eye was $^{18}/_{100}$, and with a +2.25 S. lens was brought up to $^{18}/_{20}$. This I prescribed for distant use, together with a +5.00 S. for reading.

On August 6th, three weeks later, I was called to his house and found him suffering considerable pain through his right temple and on top of his head. His pulse was only 48, the lids of his right eye were badly swollen and the ocular conjunctiva so œdematous that it overlapped the cornea around its whole circumference. This attack, I was informed, had come on suddenly with pain from the beginning. The tension was considerably increased, and, concluding that he had had another intra-ocular hemorrhage, I applied leeches to the temple, instilled a two-grain solution of eserine sulphate, and applied locally lead and opium wash.

This treatment relieved him so much that he got a fairly good night's rest. The eserine seemed to keep the tension down somewhat, but as there was still some pain, I tapped the anterior chamber, using a cataract needle with a broad blade and a narrow shank, and the fluid which escaped was as black as ink. This operation was an immediate and permanent relief to the patient from all actual pain, but as the eye still remained sensitive and I was afraid of sympathetic ophthalmia, I advised enucleation.

This he dreaded and consequently kept putting it off.

After a couple of weeks a small distinct hemorrhage, a little larger than a pinhead, appeared on the anterior surface of the lens. This was followed several weeks later by photophobia and lachrymation of the left eye, and the patient then decided to have the offending organ removed.

On October 7th, with the assistance of Dr. Arthur Breese, who administered ether, I enucleated the eye, and on the same evening, in the presence of Dr. Breese, I dissected it.

The anterior chamber was filled with a fluid of the consistency and color of ordinary writing ink, the lens was cataractous, the ciliary process hardened, the vitreous disintegrated and its chamber filled with a thin bloody fluid. There was a small detachment of the retina just below the optic disc, and the disc was somewhat cupped, but what was of particular interest and that which leads me to report the case, was a small black tumor, about the size of a duck-shot, on the outside of the sclerotic coat about a quarter of an inch to the nasal side of the optic nerve; and on the inside of the eye, at a position corresponding to that of the tumor, was a small dimple, which gave the appearance of a portion of the retina and choroid having been pulled through a small opening in the sclera. Upon dissecting the tumor I found it to consist of a perfectly white substance surrounded by what seemed to be the sclerotic coat. I sent the specimen to Dr. William May for microscopical examination, and he pronounced it a round celled sarcoma.

In all probability it sprang from the choroid, but, contrary to the usual rule, it had, for some inconceivable reason, taken the course of the greater resistance and grown outward, pushing with it the sclera, which enveloped it like an orange is enveloped by its skin.

Whether or not this tumor was in any way associated with the intra-ocular hemorrhage, it is difficult to say. At all events, the case is one of the utmost interest, not only on account of its unsuspected presence and the relative infrequency of this variety of neoplasm, but more especially because it took the course of greater resistance, pushing the sclera before it, and was not attended by any growth or bulging within the globe, a fact which is beyond comprehension, and a similar instance of which I am unable to find in ophthalmological literature.

The opportunities of examining such a growth in this location in an early stage of its development are rare, and I only regret that I did not suspect its nature at the time I made the dissection and save the whole globe for future observation and study.

It is fortunate for the patient that the removal of the eye has given him a better chance of escaping both local recurrence and metastatic deposits.

FOUR CASES OF THIERSCH'S SKIN-GRAFTING FOR PTERYGIUM.

By F. C. Hotz, M. D.,

PROFESSOR OF OPHTHALMOLOGY IN THE CHICAGO POLICLINIC.

Illustrated.

At the meeting of the American Medical Association I suggested* the use of Thiersch's skin-grafts in the operation of very large pterygia, in which the wound cannot easily be closed by sliding the ocular conjunctiva from above downward and from below upward. The idea was that if these grafts adhered firmly to the sclera they would effectually protect the cornea against being invaded again by the pterygium, as they would present a solid wall which the conjunctiva could not push away or pass over to encroach upon the cornea.

The results in my first cases were so satisfactory that I felt encouraged to give this method a further trial, and, although I have but a few cases to report, because I have limited the application of this method to unusually large pterygia, I believe a short report of these cases will be of interest to the readers of the Annals.

In order to avoid unnecessary repetitions in the clinical history of the cases, I wish to say that in every case I first dessected up carefully the corneal portion of the pterygium, from its head back to the corneal margin; then, lifting it up with forceps, I slipped the blade of a small scalpel under it and cut all the connective tissue strings which bound the pterygium to the sclera. When all these adhesive bands were divided the ptergium receded toward the inner canthus and the normal parts of the ocular conjunctiva receded upward and downward so that a large area of the sclera was denuded, although no portion of the pterygium had been excised. Upon this denuded area a

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*A few experiments with Thiersch's skin-grafts in the operation of pterygium. *Journal of the American Medical Association*. Sept. 10, 1892.

Thiersch graft was implanted, which I cut with a razor from the skin behind the ear. In my first experiments I had cut the graft so large as to cover the whole wound, but I found it was always partly pushed over the corneal margin before it became firmly adherent. I believe this was caused by the conjunctiva crowding up against the nasal border of the graft. In the present series of cases, therefore, I used grafts which were much narrower than the wound but long enough to reach from the upper to the lower border of the conjunctival wound. These grafts were placed upon the sclera near the corneal margin; and even if one eye only had been operated upon, both eyes were bandaged for forty-eight hours in order to protect the grafts against the disturbing influence the movements of the eyes and lids might exert. After forty-eight hours the protective bandage is no longer needed; for by this time the graft, if living, is firmly adherent; if dead, it should be taken off. This latter happened but once only; and in this case I put a new graft on the granulating wound two days later and had a good result. (See case 1.)

For a long time the graft appears well marked against the surrounding conjunctiva as an opaque, white stripe, covered by a thick coat of soft epidermis cells, but, as the last two cases show, it finally loses its cutaneous character and can be distinguished from the ocular conjunctiva by very close inspection only.

CASE 1. Mr. B. M., aged 60; broad and thick pterygium on each eye, reaching to center of cornea. Operated Feb. 4, 1893. Size of skin graft, 4 by 8 millimetres.

Feb. 5. Graft on right eye looks white and wrinkled, that on left eye smooth and pink.

Feb. 6. Graft on R. eye dead and was removed. That on L. eye firmly adherent.

Feb. 8. The granulating wound on R. E., scraped and a new graft, 3 by 7 mm., put on.

Feb. 10. The second graft on R. E., firmly attached.

March 29. Grafts show plainly as white streaks, 2 by 6, along corneal margin.

CASE 2. Mrs. J. R., aged 50; large pterygium on R. E., reaching to center of cornea. Operated Dec. 14, 1894; denuded area 10 mm. wide and 14 mm. long; skin graft 6 mm. wide and 14 long.

Dec 15. On removing the bandage I found the graft had shifted a little, so that its corneal border was about 2 mm. beyond the margin of the cornea.

Dec. 17. Graft firmly adherent to sclera; but that small portion which overlaps the cornea is loose and can easily be trimmed off.

Jan. 23, 1895. Graft forms a narrow white band along the corneal margin; its epidermis can easily be scraped off with a blunt spatula, showing a smooth pinkish surface underneath.

April 23, 1895. Appearance of graft unchanged; ocular conjunctiva over nasal side of eye smooth; no trace of pterygium.

Case 3. Chas. S., aged 30, came to me in November, 1893, with a pterygium on L. E., which had been operated on three times; it consisted of a very thick, tendinous fold reaching close to the center of the cornea. Operated Nov. 15, 1893; after a great deal of dissecting I succeeded in mobilizing the conjunctiva so well that I could close the wound by five sutures without too much strain upon the wound edges. The wound healed very nicely, but after two months I noticed the first signs of the conjunctiva being again dragged over the corneal margin, and in the course of six months the pterygium had regained the same size and extension over the cornea as before the operation.

Sept. 5, 1894. Pterygium again dissected back, and a Thiersch graft, 4 by 8 mm., put on.

Sept. 6. Ocular conjunctiva red and swollen; wound surface and graft grayish red.

Sept. 8. Graft firmly adherent, smooth and pinkish, but almost one-half of it on the cornea.

Sept. 12. Eye free from irritation; graft white and firm; the portion encroaching on the cornea is removed with scalpel and forceps.

Sept. 20. Graft forms a narrow, white stripe along corneal margin; cornea smooth.

Oct. 16, 1895. Patient called on account of a slight conjunctivitis. The pterygium has not returned; the ocular conjunctiva is quite smooth; the graft is still plainly visible but it is not as white as one year ago, and its surface is smooth and glossy.

Case 4. James C., aged 55; small pterygium on R. E., reaching half way between the margin and center of cornea. On L. E., a very broad and thick pterygium, reaching beyond the corneal center; at the corneal margin it is 8 mm. wide, and from this point its edges curve so abruptly upward and downward that it involves pretty well the entire nasal portion of the ocular conjunctiva.

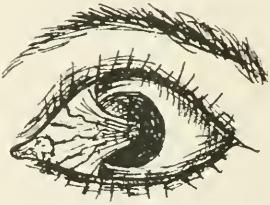

Fig. 1.

Operations on May 1, 1896. On the R. E., the wound was closed by three conjunctival sutures, but on the L. E., the large wound (5 by 10 mm.) was left open and a Thiersch flap, 3 by 10 mm., put in along the margin of the cornea. As in some of the former cases, even narrow grafts had shown a tendency to shift toward the cornea, I sutured, in this case, the upper and lower ends of the graft to the conjunctiva.

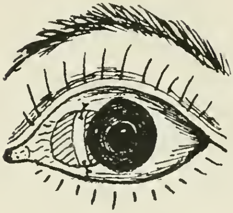

Fig. 2.

May 3. Graft adherent but eyeball is very red and painful; in the denuded portion of the cornea several small foci of suppuration.

May 6. R. E., has fully recovered and sutures are removed. The pus foci in cornea of L. E., have been absorbed, but the eye is still considerably inflamed.

May 28. L. E., now free from inflammation; corneal surface smooth, but hazy; the graft is plainly seen as a narrow, white strip along the corneal margin.

June 26. Condition of L. E., has not changed materially; a photograph is taken, of which the accompanying picture (see Fig. 3) is a correct copy.

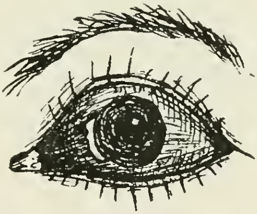

Fig. 3.

Nov. 10. The graft has lost its white color and can scarcely be distinguished from the conjunctiva; no trace of the pterygium, the conjunctiva being perfectly smooth. On the R. E., however, the ptergium had returned and its head had already advanced 2 mm. across the margin of the cornea.

The last two cases are especially interesting because they have been under observation for so long a period that we are warranted in regarding the results as final. They prove conclusively that this skin-grafting method can prevent the recurrence of ptergium and that it leaves no unsightly mark upon the eyeball. It is a comparatively simple operation and the grafts fail so seldom to grow fast in their new bed that I feel much disposed in the future to employ this method in all kinds of pterygia, small and large.

Since the publication of my first paper the operation has been successfully tried by other surgeons. A very interesting case was published by Dr. de Schweinitz in these

ANNALS (Vol. II., 1893. p. 147); a large pterygium and moderate symblepharon, following a limeburn, was successfully relieved by the transplantation of Thiersch's grafts upon the globe and into the sulcus.

Another case was reported by Dr. E. Franke, of Hamburg, in the *Centralblatt fuer prakt. Augenheilkunde* (June, 1896). A large pterygium, following an attack of pemphigus, had spread over the temporal portion of the ocular conjunctiva and advanced to the center of the cornea in spite of repeated attempts to check its advance by electro-cauterization; there also existed an adhesion of the lower lid with the cornea. The pterygium was removed from the cornea only and a Thiersch skin-graft transplanted upon it (!); at the same time the lower lid was dissected from the cornea and its wound covered with a Thiersch skin flap. Both grafts adhered and the result was satisfactory inasmuch as the symblepharon was relieved and the pterygium did not advance again upon the cornea. Why the ptergium was dissected from the cornea only, and why the sclera was not freed from it, at least far enough to put the skin-graft upon the sclera rather than upon the cornea, Dr. Franke did not explain in his paper.

Venetian Building.

TUMOR OF THE MENINGES IN THE REGION OF THE PITUITARY BODY, PRESSING ON THE CHIASMA.

By J. W. Stirling, M. B., Edin., Etc.,

MONTREAL, CAN.,

PROFESSOR OF OPHTHALMOLOGY AND OTOLOGY IN THE UNIVERSITY OF BISHOP'S COLLEGE: SURGEON OCULIST AND AURIST TO THE MONTREAL DISPENSARY AND FOUNDLING'S HOSPITAL.

On account of the comparative rarity of the following case, I think it well worth while bringing under the notice of my confreres in ophthalmic work:

J. W., aged 42, came to me in February, 1888, with total blindness of the left eye and complete right hemianopsia of the right eye.

The left eye had been noticed by the patient to have been failing since two years and the right one since eighteen months, but the latter had remained apparently stationary for the eight months preceding my seeing him.

He had pains in the joints and hands; there is some slight giddiness with a tendency to fall forward.

No history of syphilis, but patient has been a pretty heavy drinker, especially of Scotch whisky.

Vision: L. E., no perception of light, pupil semi-dilated, immobile to light, but reacts on stimulating the seeing portion of the right eye with light.

R. E., Complete blindness of outer side of field; the inner side was amblyopic, vision being reduced to counting fingers at 12 feet; in the reading types he can pick out a letter of the largest size (No. 16) here and there. In this area the perception of green was very defective, also after looking at green for some time the patient observed an after-image of pink; pupil sluggish.

The fundus examination was as follows:

L. E., White primary atrophy of the disc with vessels only slightly contracted.

R. E., Disc not so pale as in left eye.

The patellar reflexes were slightly exaggerated, but there were no motor or sensory disturbances.

Frequent flushings and perspiration of the head and back of the neck occurred.

The further course of this case was very slow, six years elapsing before his death.

His sight entirely failed about eighteen months after I first saw him.

He became fat and flabby and always had a good appetite, but was greatly troubled with continuous sleepiness.

Frequent photopsia appeared, and later on he developed hallucinations of sight, imagining he could see animals crawling over him, which he could point out.

The post-mortem examination revealed a tumor as large as a hen's egg growing from the meninges and pressing on the front of the chiasma.

The microscopic examination showed it to be an endothelioma.

The diagnosis, when I first saw him, seemed to point decidedly to a growth implicating the anterior portion of the chiasma.

The visual disturbance was the only factor to base the diagnosis on, and if the patient could have been seen earlier, the limitation of the field would have doubtless been more typical.

The absence of the pupillary reflex on stimulating the blind area pointed to a lesion anterior to the basal optic nuclei, and in support also of this the presence of visible optic atrophy showed that it could not be behind the nuclei, between them and the cortex, as in lesions of the optic radiations or cortex the atrophy is never visible at the disc (Knies).

Again, and chiefly, nowhere else than at the chiasma and at its anterior portion, could there be a lesion causing bitemporal hemianopsia—the fibres from the nasal portions of the two retinæ decussating here.

A further extension of the growth toward the left would easily, through pressure, obliterate the function of the temporal fibres of the left optic nerve, and in the same way the function of the right.

When I first saw the patient, the obtunding of the vision in the inner portion of the right field, together with the defective perception of green, pointed to marked interference with the conduction of the remaining active portion of the right nerve.

There was concentric and fairly equal contraction of the field, both for white and colors, pointing to a likely slow progress of the disease; for if, on the other hand, the field for colors had been contracted out of all proportion to that for white, the progress might have been expected to be rapid.

The hallucinations of vision point to the visual cortex as still capable of function, and also to its being irritated.

Lastly, the sleepy, soporose condition is said to be peculiarly common in lesions of the pituitary body.

A CASE OF IRITIS WITH DEPOSITS IN THE CORNEA, RESULTING IN SCLEROSIS AND CHANGE OF THE NORMAL SURFACE CURVE OF THE CORNEA.

By John Dunn, M. D.,

RICHMOND, VA.

Miss W., aged 24, came for treatment in July, 1893. The diagnosis, syphilitic iritis, was made. Although the patient had, moreover, severe double periostitis of the tibia, complained much of her throat, had marked anæmia with amenorrhœa, she had, up to this time, received no specific treatment. Miss W. has now, October, 1896, been under constant treatment for more than three years, the disease proving to be unusually obstinate. During this time, besides the eye manifestations of syphilis, there have been recurrent attacks of the tibial periostitis; the menstrual flow has more than once been reestablished to cease again after a few months; there have been evidences of recurrent syphilitic pleurisy, repeated sore throats, purulent disease of the antrum, probably from a decayed tooth, followed by obstinate *otitis media purulenta*. The anæmic condition of the patient has persisted, although at times it has much improved.

When first seen there was double iritis accompanied by deposits, both large and small, upon Descemet's membrane. The inflammation of the right eye was the more severe. There was not at this time, nor at any time during the three years, severe congestion of the tissues about the cornea, such as is often the case in full-blooded people. When first seen, some of the deposits in the cornea were of the large variety. During these three years and more the right eye has never been, until the past ten days, free from active inflammatory signs. The left eye remained inflamed about two and a half years. In addition to the iritis there has been double neuro-retinitis with clouding of the vitreous. In regard to the left eye there needs to be said here that its long existing inflammation has disappeared, leaving no traces save slight displacement of pigment along the iris edge and a few minute and very faint opacities in the cornea. Vision $= {}^{16}/_{40}$.

The corneal deposits, O. D., their history and their final effect upon the cornea, demand our especial attention. At first the large deposits, whose color, as seen under a bright light with a magnifying lens, was leaden-gray, were confined within and about the limits of the well-known inferior central triangle; they were discrete and showed no tendency to run one into the other. At the same time there were scattered throughout the same area innumerable, minute, dust-like opacities. The *va-et-vient* of these larger opacities, as the intraocular inflammation grew better or worse, furnished an ever-changing picture, accompanied for many months by no evidence that pointed to permanent opacity of the cornea. During the second year of the existence of the iritic inflammation these larger opacities appeared in increased numbers. Their size in many instances became double or treble that which distinguishes the ordinary large opacity occurring upon Descemet's membrane in iritis; they were closer together and in some places coalesced and could, from time to time, be seen to be joined by minute lines, in appearance resembling short sections of a dusty thread of cobweb. Furthermore, large opacities appeared now farther and farther away from the area represented by the inferior central triangle. During the third year the cornea over the triangular area began to lose its normal curve, while at the same time the corneal tissue of this region began to become milky in appearance. Finally, the lead-colored opacities in the above-mentioned part of the cornea began to disappear, and as they did so small pits could be seen in the external surface of the cornea, rendering it thus uneven. At this time large individual opacities could be found scattered throughout the cornea, even to its superior margin. These were, however, few in number; in appearance exactly identical with those first ones seen in the inferior central triangle, which region, it is to be noted, the sclerosis of the cornea did not transcend. The pits in the surface of the cornea which were formed by contraction of the *substantia propria* from within outward (for there was never any break in the superficial epithelium), were confined to the region of the lower and outer two-thirds of this triangular area.

Besides the dust-like opacities, the large ones and the linear opacities mentioned above as resembling short sections of the thread of a dusty cobweb, there appeared in substance of the cornea, late in the third year, small, accurately-defined, slightly cloudy areas, 1 to 2 mm. in diameter, generally circular in outline, as though throughout these areas the corneal tissue for one plane only had been affected. Within these areas the minutest dust-like opacities were more distinct than elsewhere, owing to the faint cloudiness of the corneal tissue. It is to be noted here that, although we had a sclerosing process, there was no evidence at any time of the development of blood vessels in the cornea in any of its layers. The infiltrations did not assume the form known as *keratitis striata*, the cobweb opacities mentioned above being entirely different in appearance. The pitting of the corneal surface over the sclerosed area seems plainly to be the result of the destruction of localized areas of the *substantia propria* with subsequent contraction. This destruction, I take it, was caused by the great numbers present at once and the long continued presence of the large opacities causing interference with the nutrition of the part of the cornea occupied by them, viz: that upon the Descemet's membrane. Doubtless, as Knies says, the large opacities led to destruction of the endothelium of Descemet's membrane and the entrance of the aqueous into the substance of the cornea. This would bring about limited opacity of the cornea. The pitting seen on the corneal surface, however, must, I think, be attributed to contraction, the result of actual destruction of part of the *substantia propria.*

The above trouble is not to be confounded with sclerosing *keratitis punctata syphilitica*, the original part of the cornea affected in the two cases being different. The present condition of the cornea (O. D.) is as follows: No evidence of an existing active inflammatory process; the corneal opacity has thinned considerably during the last two months and has also diminished in size; retinoscopy shows very clearly a change from the normal corneal curve over the sclerosed region. The appearances of the dust-like and large opacities are well shown in Friedenwald's article in the *Archives of Ophthalmology*, April, 1896.

CONJUNCTIVITIS ASSOCIATED WITH FALSE MEMBRANE.

By Hiram Woods, Jr., M. D.,

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Pseudo-membranous conjunctivitis is usually divided into "croupous" and "diphtheritic." In the former the membrane is on the conjunctiva, and can be easily wiped off. Such a formation is often seen in the course of catarrhal and strumous ophthalmia. In diphtheritic conjunctivitis, as usually described, there is infiltration of the lids, with a conjunctival pseudo-membrane, incorporated with the underlying tissue. The lids are sometimes bloodless. The disease is rarely seen in this country. I have seen three cases—two in the practice of my friend, Prof. J. J. Chisolm, and one in my own. They all ended in loss of vision. One of his and my own case were exposed to diphtheric infection. His second case followed the application of a weak silver solution to a catarrhal conjunctiva ten days after cataract extraction. This case was studied bacteriologically by Prof. Welch, and Dr. Alex. Abbott studied mine. In neither was the bacillus diphtheriæ found. The cases are reported in detail in the *Medical News* of Aug. 29, 1892.

The first description of this form of conjunctivitis is credited to von Graefe in 1854. Fuchs* says von Graefe observed many cases of diphtheritic conjunctivitis during epidemics of diphtheria in Germany, that "in lands where diphtheria prevails the disease appears either sporadically or as an epidemic," that "at the time of an epidemic of diphtheria, other inflammations of the conjunctiva show a tendency to assume all at once a diphtheritic character."

While there is certainly a close connection between plastic infiltration of the lids and the disease "diphtheria," there is evidence that the lesions described as characteristic can develop from other causes. Caustics, such as lime, nitrate of silver, etc., have been known to produce it. Fuchs, in warning against the dangers of strong caustics in conjunctivitis, says that nitrate of silver can change a "croupous" into a "diphtheritic" conjunctivitis. Noyes* has recorded a case of typical "diphtheritic" conjunctivitis following tenotomy for squint. Prof. Chisolm's silver case is another example.†

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*Fuchs. Lehrbuch der Augenheilkunde, S. 93, 1889.

To such clinical evidence one must add the experimental production of lid infiltration, with false membrane on the conjunctiva, by jequirity. Again, bacteriologic study has shown that the bacillus diphtheriæ is present often when the supposed essential symptoms of infiltration, etc., are absent. The number of cases of pseudo-membranous conjunctivitis which have shown pure cultures of the bacillus diphtheriæ does not seem to be large; but in the few I have been able to find, clinical symptoms were trivial. My friend, Dr. Flexner,‡ of Johns Hopkins Hospital, has kindly furnished me with notes made by him in the preparation of his recent paper upon "The Bacteriology and Pathology of Diphtheria." Thus, Fraenkel and Uhthoff have found that diphtheria bacilli are not seldom in the conjunctival sac. The mucous membrane can be quite normal, or show a catarrhal inflammation; or, finally, a thin croupous exudate may be present, entirely different from conjunctival diphtheria as usually described. Again, Escherich reports two cases in which diphtheria bacilli were found in the exudate; both pursued a favorable course. These observations are quite in accord with those of other writers, notably Abbott, who has found the bacillus diphtheriæ in membranous rhinitis without special symptoms, and in the healthy pharyngeal and nasal mucous membrane. In a personal communication, Dr. Wm. T. Howard, Jr., has told me of a case of pseudo-membranous conjunctivitis, with trivial clinical symptoms, but showing pure cultures of diphtheria bacilli.

The ANNALS OF OPHTHALMOLOGY AND OTOLOGY for April, 1895, reports from the *Medical Press*, of Feb. 13, 1895, two cases presented to the Opthalmological Society of the United Kingdom, by Mr. W. H. Jessop. The typical diphtheritic infiltration was wanting, though cultures from the membrane in the eyes of both children, and from the pharynx of one and nose of the other, showed the bacillus diphtheriæ. It is interesting to note that, save washing with distilled water, Jessop used no local treatment. Klein's antitoxin was used in both cases, and the membranes in the eyes faded away in three or four days.

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*Noyes. A Text-Book on Diseases of the Eye. P. 313. 1890.

†Dr. Alvin A. Hubbell, of Buffalo, N. Y., has reported a case presenting typical lid infiltration with false membrane on the conjunctiva, terminating in recovery, in which there was no exposure to diphtheria. Proceedings New York State Medical Convention, 1887.

‡Flexner. The Johns Hopkins Hospital Bulletin, No. 48. March, 1895.

Appended are notes of five cases of pseudo-membranous conjunctivitis, which have come under my care or notice in recent years, and which have been studied bacteriologically.

Case 1. White child, five years old, seen in March, 1895, at the Presbyterian Eye and Ear Hospital. Catarrhal discharge from left conjunctiva, swelling of lids, with moderate infiltration. Conjunctiva of upper lid was covered with a false membrane, which was easily wiped off. Culture from the membrane was sent to Dr. Flexner. He reported the case as due to streptococcus infection. The eye recovered under treatment with a 1 to 4000 corrosive sublimate solution in a few says.

Case 2 was seen in June, 1895. The patient was three years old. On the conjunctiva of the lower lid, left eye, there was a membrane, with moderately firm adhesions, the lids being free from infiltration. There was scant watery discharge. Dr. William T. Howard, Jr., examined the culture, and found it a streptococcus infection. The eye recovered.

Case 3 was seen at the Presbyterian Eye and Ear Hospital, in June, 1895. Dr. C. W. Hartwig, to whom it belonged, has allowed me to use it here. A colored boy, one year old, presented a typical picture of gonorrhœal ophthalmia. The lids were hard, swollen, and an abundant discharge of pus was present on both sides. In addition, on the upper palpebral conjunctiva, each side, there was a thick, grey, adherent false membrane. Dr. C. O. Miller, pathologist to the University Hospital, found gonococci in cover-slip preparations. Both eyes recovered.

Case 4 was seen at the Presbyterian Hospital, in March, 1895. Patient was a badly nourished child, one and a half years old. Right eye only was affected. There was scant watery discharge, congested conjunctiva, but no hardness of lid. A false membrane covered the conjunctiva of the upper lid. It was quite firmly adherent. An inoculated tube, examined by Dr. Flexner, showed streptococci. The eye recovered.

Case 5 was a Bohemian child, three years old, brought to the Presbyterian Eye and Ear Hospital in March, 1895. The lids were only slightly swollen, not at all indurated, easily everted. There was very little discharge. The right eye was first affected, and in two days the left. A thin film of membrane was found on the upper and lower lids of each eye. An abraded skin surface on the right lower lid was speedily covered by the membrane. The right cornea was superficially cloudy, the left clear. The child, on admission, had a temperature of 101°. A tube inoculated from the membrane on the conjunctiva of the right upper lid was pronounced by Dr.

Flexner a pure culture of the bacillus diphtheriæ. There had been no exposure to diphtheria. The child's pharynx and nose were clear.

During my service at the University Hospital, in April, 1895, I saw an old man, suffering from a streptococcus infection of the right side of the face: pronounced so by Dr. Miller. There was board-like infiltration of the lids —upper and lower—with great œdema of the conjunctiva. An incision had been made by one of the house physicians through the tense lower lid. A false membrane had formed over the cut, and persistently reformed when removed. Free and repeated incisions resulted in recovery, the eyes not suffering from the pressure to which they were exposed.

Three cases of the five of membranous conjunctivitis were due to streptococcus, one to gonorrhœal, and the fifth to diphtheritic infection. In the case of the old man the false membrane formed in the lid incision, while the conjunctiva was œdematous. There seems no reason to doubt that, had incisions been made in the mucous membrane, the false membrane would have formed there—just as it did wherever a skin cut was made. In the diphtheric case (5), there was less evidence of lid infiltration than in the others. The corneal damage was probably due to direct infection, for the pressure symptoms were insignificant.

It would seem that lid infiltration is not characteristic of diphtheric conjunctivitis; that a pseudo-membrane can result from a variety of infections; that danger to the cornea may be great without infiltration of the lid structures, and that the diagnosis of conjunctival, like faucial diphtheria, must be made by the bacteriologist.

816 Park Avenue.

THREE CASES OF INTRAOCULAR NEOPLASM.

By Dr. David H. Coover,

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Illustrated.

Mrs. P., age 32 years, consulted me August 26, 1893, complaining that the sight in her left eye had been failing for the last four months, and at times had slight attacks of inflammation, which would pass off in a few days. No history of injury could be elicited; vision $^{20}/_{40}$, tension minus, the eye normal in appearance, no pain or tenderness, pupil active. The ophthalmoscope revealed in the upper and nasal part of the fundus, just a little posterior to the ciliary body, what I supposed to be a detachment of the retina. The bluish-gray retina was in waves or folds and vessels ran across in undulating curves; it was semi-transparent and distinct fluctuation was observed upon movement of the eye. No distinct line of demarkation between the healthy and detached retina could be seen, as in the case reported by Dr. Fox. No evidence of any choroidal changes was visible. The case was closely watched for a week, when the vision fell to $^{20}/_{70}$. The patient was placed upon pilocarpine hypodermatically. Under this treatment her vision fluctuated from $^{20}/_{70}$ to $^{20}/_{40}$. At one time thought I discovered a dark mass through the retina, but was not positive. I had three ophthalmic surgeons examine the case, and all were very undecided as to its true nature, but favored a detachment more than tumor.

I decided to make a scleral puncture for diagnostic purposes. A Graefe knife was passed through the sclera at the most sagging part of the retina; considerable straw-colored fluid escaped, the eye was immediately examined with the ophthalmoscope and retina had greatly receded. There was no reaction whatever from the operation. Forty-eight hours afterward the fundus was again examined and retina found to be bulging downward as much as ever and fluctuation more pronounced than ever before. I explained to my patient the serious character of the affection and possibly that it might be a malignant growth. The patient returned to her home, which was some distance from the city, and informed me by letter that her vision was becoming less, eye quiet and free from pain. About four months afterward she came into my office one morning, complaining of great pain in the eye, which had come on the day before. I found the eye inflamed, iris bulged forward, pupil dilated, tension +3, vision nil. Enucleation was performed at once. On opening the eyeball found a large growth filling up fully $^3/_4$ of the viterous chamber. It was attached by a broad base, body was round, slightly irregular and dark brown in color, measuring 11 mm. long by 13 mm. wide. The retina was not adherent to the growth at any part of it.

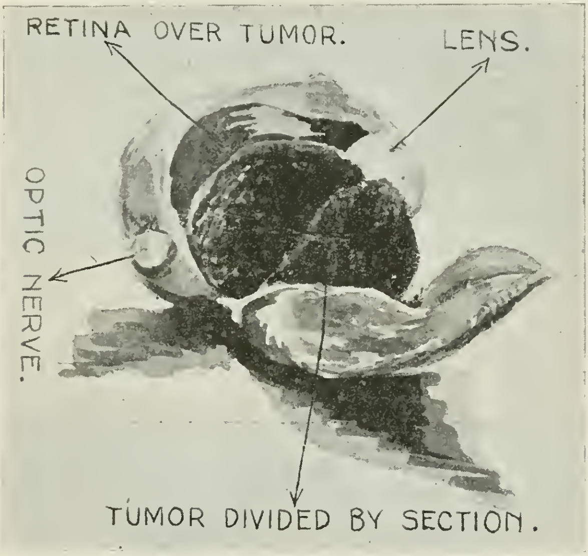

Fig. 1.

The specimen was placed in a hardening fluid and microscopical examination made by Dr. E. R. Axtell: the following is his report:

"The mass consists of embryonic blood-vessels and small spindle-shaped cells. It has no definite capsule. The spindle cells are, in places, arranged in bundles which interlace and circle in all directions so that cells are seen in various sections. The embryonic blood-vessels are quite numerous and consist of modified sarcoma cells only. A quantity of black granular pigment lies between the cells; along the embryonic blood-vessels and in many places it seems to occupy the protoplasm of the cell, forming a brownish-yellow mass. No fibrous connective tissue found in any part. Two hemorrhagic extravasations show in section.

Diagnosis: True small spindle-celled sarcoma (pigmented). See Figs 2, 3, 4 and 5.

Up to the present time the woman is in perfect health.

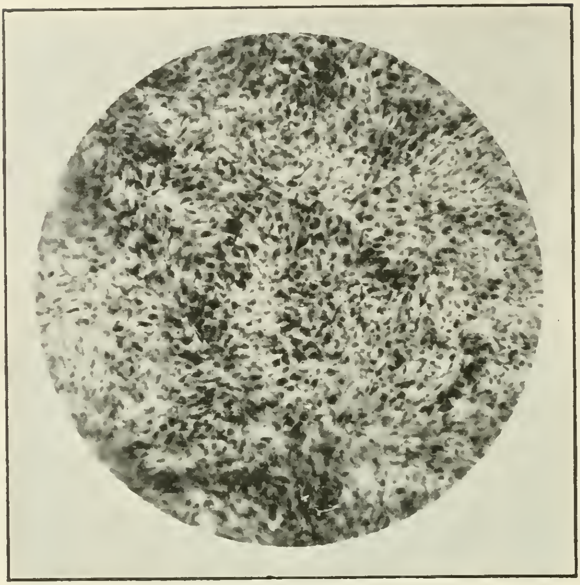

Fig. 2.

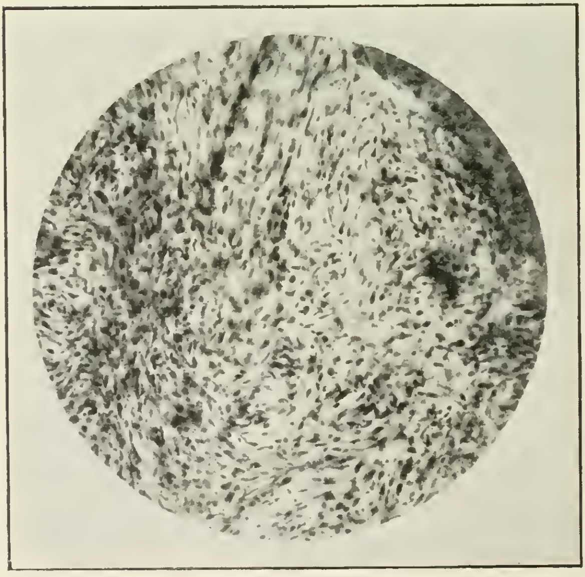

Fig. 3.

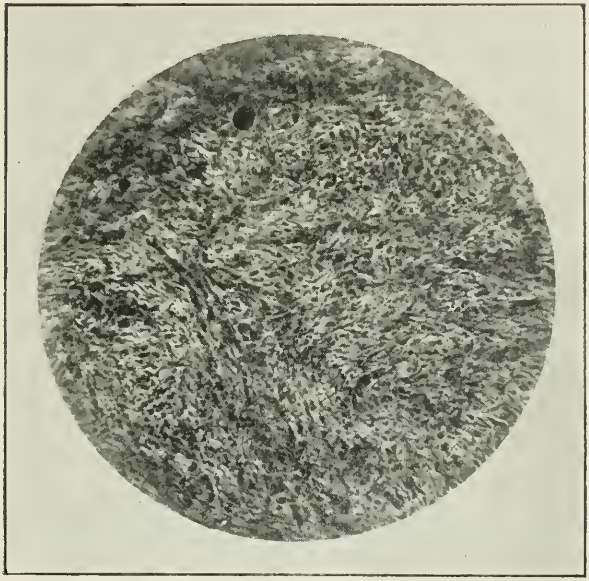

Fig. 4.

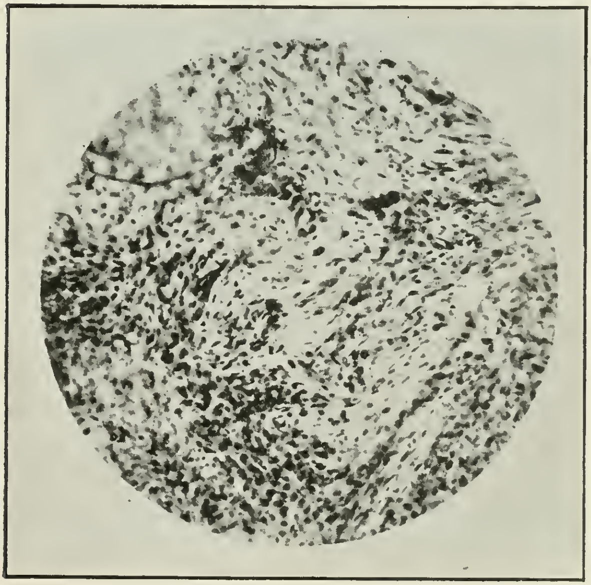

Fig. 5.

Growth Involving Iris and Ciliary Body.

John S., age 11 years, colored. brought to me March 23, 1889, on account of a growth in pupil of left eye.

History: His parents noticed a white growth in the pupil about ten days before consulting me, which had been steadily getting larger. The eye had been inflamed and painful; no history of injury or syphilis, but always weak. Father is scrofulous.

Appearance of eye: There was considerable ciliary congestion, pain, photophobia, ciliary tenderness, pupil dilated and slightly oval, iris not discolored, tension slightly increased, P. and P. good, counts fingers at 10 feet (illiterate). At the inner and lower margin of cornea was a small crescent-shaped ulcer. In the lower margin of the pupil, between iris and anterior capsule a white, slightly yellowish tumor was seen projecting into pupillary space. The edge was serrated while the body seemed regular and appeared firmly attached to the iris. The lower half of iris was bulged forward. No iridodialysis or hemorrhage in anterior chamber. The ophthalmoscope revealed a clear media, no tumor in fundus or posterior chamber, disc congested and vessels full.

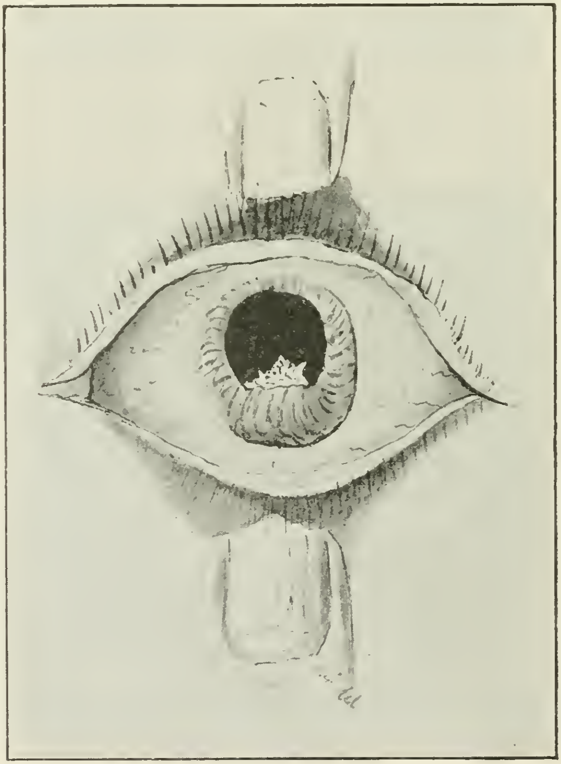

Fig. 6.

No vessels were seen on the tumor by the ophthalmoscope or oblique illumination.

March 27. Growth no larger in pupil but more bulging in anterior chamber, lower part of the lens hazy and displaced backward. In the lower part of the fundus corresponding to tumor the edge of the growth was seen coming from under the lens from the ciliary region. Pain and ciliary injection the same.

March 29. Growth in fundus increasing; pain and ciliary injection less, tension same, haziness in lens increasing toward the center. The opacity in the lens advanced more rapidly than growth in the fundus, for in a few days the fundus could not be seen, only reflex from the upper and nasal filled. Ciliary injection and tenderness less, pain gone, tumor in pupil becoming more of a yellowish hue and drooping of the upper eye lids.

Advised enucleation but parents would not consent. Two weeks afterward saw the case again: eye quiet, growth anteriorally stationary, vision nil and lens opaque, ptosis complete. Again advised the removal of the eye and was again refused, and never saw the case afterward, as the parents moved away.

From what I can learn of cases reported of this character, there is usually irido-dialysis, tumor projecting into anterior chamber, or penetrating or bulging of the sclerotic, recurrent hemorrhage, ciliary irritation and pain as the growth increases. In this case the tumor appeared on the posterior surface of the iris, showing itself in the pupillary space first, with ciliary tenderness and pain. Instead of projecting anteriorally sufficiently to rupture the iris, it passed underneath the lens and appeared in the posterior chamber. No hemorrhage, pain and ciliary tenderness became less as the growth passed posteriorally.

Whether this was a growth from the posterior surface of the iris or ciliary body, or whether it was a new growth of some character, or malignant in its nature, I was unable to fully determine. I am sorry I failed to get the eye, as it would have been macroscopically and microscopically interesting, and cleared up the diagnosis.

Glioma of the Retina.

M. J., aged 2 years, female, was brought to me by parent Sept. 8, 1890, for a peculiar affection of the left eye.

History: About six months previous to consulting me the mother noticed a white spot on the lower and outer part of iris, and a greenish-yellow reflex from the eye when it was rotated in a certain direction. This spot gradually increased, when, two weeks before coming to see me, noticed a number of them studded over the iris.

On examination of the eye I found the whole of the anterior surface of the iris studded with small white bodies, varying in size. In some places they had coalesced and formed patches. The pupil was semi-dilated and a portion of the mass projected into pupillary space; lens clear, no reflex as posterior chamber was filled with the yellowish mass. The whole of the retina was completely absorbed by the growth.

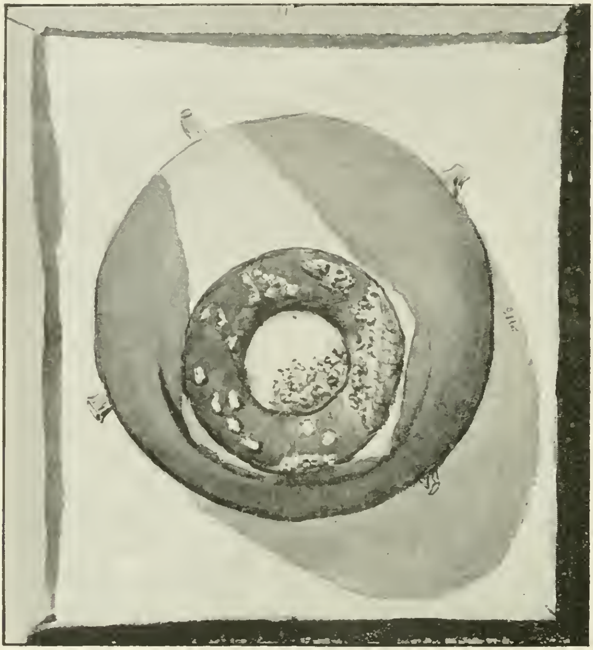

Fig. 7.

Enucleation was advised, and the parents consented after they learned of the serious nature of the tumor. The eye ball was removed, at the same time excising with the globe a portion of the optic nerve. On opening the eye I found the posterior chamber completely filled with the growth, but nerve was free from it.

Microscopical examination revealed a true glioma.

Up to the present time the child is living and in good health.

FOUR CASES OF SUCCESSFUL REMOVAL OF FOREIGN BODIES FROM THE EYE.

By Charles W. Kollock, M. D.,

CHARLESTON, S. C.

Since the introduction of the electro-magnet, many eyes have been saved, not only in shape and appearance, but for useful vision; but, unfortunately, the successful removal of the foreign body from the eye does not always insure its future safety, either as to vision or appearance, and very many cases might be recorded where the eye was finally lost from iridochoroiditis. And even this is not the worst that may happen, for the good eye may become sympathetically inflamed and be lost, or, very seriously impaired for usefulness. Therefore, while the first effort must be toward removing the foreign body, the cure is by no means sure after this has been accomplished, and the real skill and knowledge of the physician will then be taxed in order to prevent the fatal inflammation which so commonly follows the introduction of poisonous germs along with the foreign body. It has been noted that sympathetic ophthalmia is less frequently seen than formerly, and this can be accounted for by the strict attention that is paid to secure absolute cleanliness in every detail. The after-treatment, in many instances, is of equal importance and should consist not only in continued attention to cleanliness, but in the judicious employment of such drugs as atropine, pilocarpin, and last, but by no means least, *mercury*. The last mentioned remedy is without doubt the most powerful aid that the surgeon has for combating that most fatal of dangers to the sight, uvetis or choroiditis.

Case 1. A machinist was struck in the left eye by a scale of iron that measured 4 mm. in length by 3 mm. in breadth. He was seen a short time after the accident occurred, and a small wound was found in the sclera near the lachrymal caruncle and just behind the ciliary region. The eye was carefully cleansed and then the point of a small probe was introduced into the vitreous humor and soon came in contact with the metallic body. The point of the electro-magnet was carefully inserted and immediately the body was attracted and brought between the lips of the wound, where it was easily caught by a pair of forceps and extracted. The eye made an uneventful recovery and the vision, even immediately after the operation, was not affected by the injury. One year later the eye was examined and found to be in perfect condition.

Case 2. A man was struck in the left eye by a piece of steel that flew from the edge of a chisel. The particle, perhaps a scant millimeter in length, entered the outer half of the cornea, penetrated the anterior chamber and passed partly through the iris, where it lodged about midway between the periphery and pupillary margin, so that the anterior portion was in the anterior chamber and the posterior impinged against the lens capsule. There it remained for a year, causing, from time to time, mild attacks of iritis and some indistinctness of vision, but, considering the position in such a sensitive membrane as the iris, giving comparatively but little inconvenience. Through an opening in the cornea, made by a lance knife, the point of the magnet was introduced and the body was withdrawn from its position to the opening and extracted by forceps. By the aid of the ophthalmoscope, opaque striæ were plainly visible in the lens near the point where the capsule had been wounded. Vision was $^{20}/_{40}$. His physician wrote several years later and stated that the eye had caused no further trouble, that a marked improvement had taken place in the vision, and there were no signs of cataract. This case is of interest, and instructive for three reasons, viz: (1) the foreign body remained in the iris for more than a year without producing fatal complications; (2) the lens did not become opaque from the injury; (3) that though there were numerous opaque striæ in the lens, the vision was not further impaired, but, on the contrary, improved to a considerable degree.

Case 3. A piece of steel flew from the head of a chisel and entered the right eye of a man through the outer half of the cornea, penetrated the anterior chamber and lodged in the lens, leaving a portion projecting backward into into the anterior chamber upon which the pupillary margin of the iris was caught, and which, of course, prevented full dilatation of the pupil by atropine. A small opening was made at the outer margin of the cornea, as near the body as possible, the magnet point was introduced and efforts were made to extract the steel, but it was too firmly imbedded and could not be moved. An iridectomy was then performed with the hope that the particle would come away with the section of iris to which it was attached; but, though it was dislodged from the lens, it dropped into the anterior chamber, which simultaneously filed with blood from the cut edges of the iris. This made the difficulty still greater, as the exact position of the body could not now be located. The point of the magnet was again introduced and then an unexpected phenomenon occurred, which, it seemed, would dissipate all chances of successful removal of the body at this sitting, if not for all time. As the point of the magnet entered the chamber the blood coagulated firmly, and it was natural to suppose that the body was caught and would be firmly held in the clot, which would prevent its withdrawal by the magnet. The coagulating of the blood, however, proved a help instead of an obstacle, as was expected; further bleeding was stopped, the clot was easily pushed aside, and the particle, which lay beneath it, was now readily attracted by the magnet and easily withdrawn by the forceps. The eye was saved, but the lens became opaque.

Case 4. A man was chipping a mill-stone when a particle of the stone entered the center of the cornea, passed through the anterior chamber and imbedded itself in the lens, which soon became opaque. One year later the lens was extracted and the foreign body, which was firmly fixed in its substance, came out with it.

When the lens is soft instead of hard, much greater difficulty will be experienced in removing a foreign body from it, as it is more than probable that it would sink to the bottom of the capsule and remain there when the soft lens matter was evacuated, or it might escape into the vitreous and cause a still more serious complication. The management of foreign bodies that are loose in the lens capsule is, therefore, at times, perplexing, and the manner of removing must depend upon each case. When of iron or steel, a small, flat magnet point, sharp enough to tear the capsule, may be entered through the corneal incision and the body removed before the lens matter has been evacuated. When the body is a substance or metal not attracted by the magnet, one of three courses may be followed: 1. It may escape with the lens matter when the capsule is opened. 2. It may be removed with the lens in the capsule, after the method advised by Pagenstecher for extracting cataract. 3. After the evacuation of the soft lens substance and the eye has entirely healed, the body may be seized by forceps through a small opening in the cornea and withdrawn.

ON THE TREATMENT OF INSUFFICIENCY OF THE INTERNAL RECTI MUSCLES.*

BY ARTHUR G. BENNETT, M. D.,

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Of all the varieties of heterophoria there is none that yields so readily to simple and physiologic methods of treatment as the smaller degrees of exophoria, better, perhaps, spoken of as insufficiency of the internal recti muscles.

In 1893 my attention was arrested by an article in the *Medical News* on the treatment of heterophoria without operation, by Dr. George M. Gould, of Philadelphia. In this article the writer more particularly dwells upon the treatment of exophoria. His method being the stimulation of the innervation of the adductor muscles by a system of exercises with prisms with the bases out, beginning with a pair of low numbers and increasing their strength as the power of adduction increases, gradually working up to a pair of 25° or 30°. and in some instances even higher. The success reported by Dr. Gould induced me to give this method a trial, and the conclusion arrived at, after three years' experience, is that this plan of treatment is one of the most valuable therapeutic measures that the ophthalmologist has at his command. excepting only thorough and careful refraction.

Cases of insufficiency of the internal recti muscles are very common, more common than generally believed. Our duty to our patients is not complete if we are satisfied to use the Maddox rod test and rest content if the flame is bisected by the bright line. The strength of the muscles must be measured, the amount of abduction and adduction carefully estimated, and the relationship between them noted. Many cases of extremely weak converging power will, with the Maddox rod, show orthophoria. By way of parenthesis I wish to record my opinion that the Maddox rod test is by no means a trustworthy one; with it it is perfectly easy to show orthophoria with quite an appreciable degree of heterophoria. I can personally, with but slight effort, bring the bright line through the flame with a 30° prism, base out, before one eye. A patient that is examined several times unconsciously learns this trick, and the results then obtained are misleading and untrustworthy. No such objection can be urged against the phorometer of Dr. George T. Stevens. This instrument is simple, accurate and delicate, showing very slight deviations from parallelism, which are entirely lost by the rod test.

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*Paper read before the Buffalo Ophthalmological Club, Oct. 26, 1896.

Patients suffering from insufficiency of the interni are apt to be found among the classes that use their eyes for near work rather than among the workers out in the open. I have found it particularly prevalent in young lawyers, students, physicians and women, the three former classes doing considerable near work in reading, writing, and the use of the microscope (so often improperly used, with one eye screwed up and accommodation at its highest tension), and women accommodating and converging for long hours at a stretch over necessary household sewing or useless embroidery.

The symptoms complained of are: First, those very similar to those produced by a refractive error, viz: headache over eyes or in temples, in the occiput or back of the neck, when using the eyes, fading and blurring of print after reading for a short length of time, and a feeling as if a string were pulling the eyes back into the orbit. Secondly, not so common as the first, but occurring in a number of cases, what I have termed the *Panorama headache*. This headache is experienced when the patient attends church or the theatre, goes shopping, rides on the cars or sails on the water (though not a ripple may be disturbing its serenity), in short, a headache that is caused by viewing objects at a distance, and moving objects particularly. This *panorama* headache is not found only, nor always in, cases of exophoria; in fact, is more liable to accompany esophoria, but occurs sufficiently frequently to be noted as a symptom to be looked for. Thirdly, car sickness is another symptom not to be forgotten, while gastric neuroses frequently have as their underlying cause some variety of eyestrain, and insufficiency of the internal recti is, in many instances, the particular strain responsible for the disturbance.

The method of treatment is substantially as follows: The amount of exophoria is noted, the abduction is then measured, followed by the measurement of the normal power of adduction. The patient is then coaxed along to overcome as strong a pair of prisms with the bases out as possible in this manner; a pair of prisms just a little stronger than the normal power of adduction are placed in the trial frames; these will, of course, cause diplopia for the distance, but not, as a rule, at the near point. The patient is then requested to fix his gaze on a mark made on a card (a cross or a dot 7 or 8 millimetres in size), which is held at the reading distance or nearer. The card is then gradually withdrawn until 20 feet is reached, the patient endeavoring and being encouraged to maintain single vision all the time. In my office I have a small gas jet, the size of a candle flame, twenty feet from the patient's chair. I withdraw the card in the direction of the flame, and when I have reached this point the patient is fusing the double image of the flame instead of the mark on the card. This manœuvre is then repeated with stronger pairs of prisms until the limit of adduction is reached. It will generally be found that a pair of 10 is as much as can be overcome at first, and sometimes not so high as these, but if the exophoria is not too great, it is seldom that, after a few trials, a patient cannot fuse the image of a candle flame at 20 feet with this handicap.

My plan is now to prescribe a pair of prisms, bases out, suiting the strength to the indications, giving just a little less than the full amount of adduction, and instructing the patient to place himself twenty feet from a flame and endeavor to fuse the double image; if it is impossible for him to do so at this distance (and it generally will be impossible) to approach the flame until he gets the single image, then to back off, keeping his gaze steadily fixed on the flame, until he reaches his starting point.* Then, if the image is still single, to hold it steadily so for about a quarter of a minute, then to raise the glasses and gaze at the flame with naked eyes for the same length of time, and repeat this ten times three times a day. This I instruct my patients to do for a week. During the first few days complaint will be made that the exercise is difficult and tires the eyes, but before the week is over it becomes perfectly easy. At the next visit the strength of the prisms is increased and the exercise continued at home, and at each succeeding visit an addition of about 5° can be prescribed until the patient can, without the slightest trouble, overcome a pair of 25° or 30°. I had one patient who easily overcame a pair of 45°, but this I consider unnecessary. An arrangement was effected with an optician to lend prisms and make the necessary changes for the very moderate charge of a dollar a month. This pays the optician a good percentage on his outlay and the patient is saved the expense of buying a whole outfit of glasses, that would be absolutely useless to him after a few weeks.

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*As Dr. Gould pointed out, this is much more difficult for the patient than having some one withdraw the marked card from the near point to the flame, so that whenever feasible I prefer my patient to call in the assistance of a second person, particularly in the earlier days of this treatment This assistant, unfortunately, is not always available.

My experience has been that, in moderate degrees of exophoria, or in cases in which there is no exophoria, but a lack of power of convergence, that the symptoms disappear after the second week, but I do not consider this any indication to stop treatment, for I have found that unless the adduction is forced up to 50° or 40° at the least, the trouble is apt to return, but that if the patient can overcome a pair of 25° prisms, the cure is permanent. The higher the degree of insufficiency, the more necessary does it become to force up the power of convergence.

The point I particularly wish to emphasize is that insufficiency of the interni is not necessarily accompanied by exophoria; in fact, a few of my cases have even showed a slight esophoria. I quote the following by way of illustration:

Case 3. Mrs W. E. M., aged 28, American, in good social standing, complains of pain in the eyes, frontal and occipital headache: she cannot read or sew for any length of time, and her eyes smart and burn. An examination shows a mild conjunctivitis, both fundi normal. Her refraction under homatropine mydriasis is as follows: R. E. V. with —0.50, Sph. $^{20}/_{20}$, L. E. V. $^{20}/_{20}$, no improvement with glasses. Maddox rod test shows esophoria $2^{1}/_{2}°$. Adduction 14°. I began exercising with prisms and ordered a pair of 5° base out, and increased the strength from time to time until a pair of 25° could be readily overcome. The symptoms began to diminish as the converging power increased, and disappeared entirely about a month after beginning treatment. I first saw this patient in April, 1894, and at the last report, some eighteen months later, she was perfectly comfortable.

Another case of esophoria that was cured by this treatment is the following:

Case 36. Mrs. G. C., an American, 29 years of age, was referred to me in July of 1896. She complained of constant headache, from which she suffered all her life. She had been partially relieved for about eighteen months by wearing a pair of glasses prescribed by another oculist, which were as follows: Right and left +1.25 Cy, Ax' 90°. But the headache having returned, she consulted me. I found her refraction to be as follows:

R. E. +0.50 D. Sph. and +1.50 Cy. Ax. 90°
L. E. +0.75 D. Sph. and +1.25 Cy. Ax. 90°

These glasses were ordered less +0.50 D. Sp., but no relief was experienced from this change. She had esophoria of 2°, her abduction was 10°, her adduction was only 18°. Prism exercises were instituted, the headache was lessened almost immediately, and when her adduction had reached 60° her headache had disappeared. I received a letter a few days ago from Mrs. C.'s husband in which he tendered me the thanks of himself and wife for the benefit that she had received from this simple method of treatment.

In the following case the result has been satisfactory and all symptoms have disappeared.

Case 21. Louisa S., a German-American girl, aged 21, a typewriter and stenographer, consulted me for headache and pain in the eyes that occur after working for a short time. Her refraction under full mydriasis I found to be, R. E. with +0.37 Sp. $^{20}/_{20}$, L. E. with —0.50 Sph. $^{20}/_{20}$. These glasses I prescribed, with the result that the headache was lessened but not entirely cured. She returned for further advice. Examination of the muscles resulted as follows: Abduction 6°, adduction 20°. Stevens' phorometer gave perfect orthophoria. I prescribed prism exercise, giving at first a pair of 10°, and increased from time to time until she easily overcome a pair of 25°. The result was entirely satisfactory. The headache absolutely disappeared, as also pain in the eyes. She works now with perfect comfort.

It is not usual to find a lack of converging power in cases of esophoria, I admit, but that it is not impossible the foregoing cases demonstrate.

Believing, as I do, that the successful opthalmologist must be, before everything else, a careful refractionist, it is my practice, when consulted by a patient complaining of asthenopia or headache, to first submit him to a thorough and painstaking refractive examination and then to examine the state of the muscle balance. Should I find an error of refraction and also a condition of heterophoria, the refractive condition only is prescribed for, but the patient is informed of his muscle error and requested to report from time to time. In many cases the fitting of correct glasses is sufficient to relieve every symptom. In others, the removal of a portion of the load gives much relief for a considerable time, but later on a return of the symptoms necessitates the treatment of the heterophoria. In still another class of patients the refractive correction gives little or no relief, and measures directed toward the abolition of the heterophoria must be instituted at once. The general health of the patient must not be overlooked. Exercise in the open air, tonic treatment, and proper elimination of waste products of digestion, are wonderful agents for the relief of an insufficiency of any muscle, and the eye muscles are no exception to the general rule. I recall one case in which the prescription of a bicycle did more for the relief of asthenopia than any treatment that had been especially directed toward the relief of a large degree of exophoria. On the other hand, the general health will improve immensely, in the majority of cases, when a weakened innervation of the interni is so toned up by systematic gymnastic treatment that they can, without fatigue, hold the eyes in the necessary convergent position.

Occasionally a case of divergent strabismus can be cured by prism exercise, but a partial tenotomy of the externals, one or both, will accelerate the cure, and save much valuable time. A rule that I believe is a safe one to follow, is never to over-correct by a tenotomy, and to follow up the operation immediately with prism exercise; do not wait for the tenotomized muscle to unite in its new position and later on contract, but stimulate the internals to fight, and push their advantage to victory while their opponents are nursing their wounds. Much, however, can be done without operation, and many a nervous woman will go through months of treatment rather than submit to the slightest cutting procedure.

CASE 32. Mrs. T. M., an American, aged 36 years, was of this class. She had been a martyr to headache all her life, hardly knowing a minute's relief; two or three times in every week she was compelled to go to bed with sick headache and was utterly unable to attend to her necessary household sewing. She had a periodic divergent strabismus, but could converge at the near point. Her refraction was found to be, under mydriasis, R. E. —0.37 D. Sph. with +0.62 D. Cy. Ax. 60°. L. E. —0.12 D. Sph. with +0.37 D. Cy. Ax. 90°. Those glasses were ordered. She was also directed to exercise her adductive muscles for a week, by converging on the end of a pencil approaching and withdrawing from the eyes to arm's length. At the end of a week I found that by slowly and steadily coaxing her along she could, for a brief time, overcome a pair of 6° prisms, bases out, at 20 feet distance. These were prescribed and the exercise carried out for two weeks, then a pair of 8°s were ordered, and from time to time the strength of the prisms was increased. Her headaches were lessened when her adductive power reached 20°, and entirely cured, when I dismissed her three months after instituting treatment, with an adduction of 60°.

In the following case I operated, but, with my present experience, I feel sure that I could accomplish the same result by exercise.

CASE 15. Louise W., a bright, intelligent American girl, 17 years old, was referred to me by Dr. Crockett for examination. She complained of severe frontal and temporal headache, dysmenorrhœa and constipation. Dr. Crockett wished an ophthalmic examination before proceeding to treat the pelvic disorder. I found the patient to be emmetropic—in my experience a very rare condition—but she had an exophoria of 3°, with an abduction of 12° and an adduction of 14°. The patient was told that exercises with prisms would probably relieve the head symptoms, or that an operation could be performed. To my surprise the operation was chosen. I preferred to divide the result between the two eyes, so on May 10, 1895, a partial tenotomy was performed on the left externus, and on May 29, 1895, another on the right, and the eyes were left in perfect balance. But little improvement was noticed in the headaches until I insisted on the prism exercises, when they almost immediately lessened, and in one month were entirely cured, the adduction at this time being 50°. I have heard from the patient at intervals, and at the last report there had been no return of the headaches. Dr. Crockett also tells me that as her head symptoms disappeared the menstruation became normal and that the constipation vanished. This may be purely coincidental, as I do not wish to be understood as recommending prism exercises as a cure for dysmenorrhœa or chronic constipation.

In the next case, however, I do not think that much would have been accomplished by exercise alone, as the patient was neither intelligent nor persevering.

CASE 34. Ellen S., an Irish girl, aged 19, was referred to me by Dr. R. H. Johnson, of this city. She had been treated for constant headache with most of the various coal tar preparations. Examination disclosed a marked periodic divergent strabismus. Her refraction was, R. E. —0.25 Cy. Ax. 180°, L. E. —0.25 Cy. Ax. 90°, with perfect vision in each eye. An operation was advised and performed, a partial tenotomy of the right externus. Directly following the operation the adduction was 30°. No prism exercise was ordered. For about a month there was complete cessation of headache and the patient reported that she was more comfortable than she had been for years. Gradually, however, the trouble began to reassert itself, and the adduction slipped down lower and lower, until the condition was almost as bad as in the beginning. I then operated on the left externus with success, but immediately prescribed a pair of 10° prisms for exercise, and increased their strength as the interni gained in power. When last seen her adduction was 40° and her headaches had not returned, but I advised her to keep up her exercises for at least a month longer. If she will do as I recommend, I feel sure that the result will be permanent.

It is occasionally found that, in spite of quite an appreciable degree of exophoria, that the abduction power is not increased and may even be lower than normal. It would be manifestly absurd to weaken a muscle that is only of normal power or perhaps below par. Why this seeming contradiction should exist I am not prepared to say from my own experience, but in a recent conversation with Dr. Stevens he told me that if the rotation of the eye were measured by means of his recent invention, the tropometer, it would be found that there existed a limitation of movement, either in the superior or inferior recti, even if no hyperphoria was discoverable by any of the ordinary tests, and that no operation on the external muscle would cure the exophoria, but that if the eyes were adjusted. by operation on the superior or inferior recti to the proper level, that the exophoria would cure itself. Having, however, had no experience whatever in the use of this instrument, and knowing of no method by which the rotation of the eye could be accurately measured except by its use, I have treated this class of cases by means of prism exercise with gratifying results.

To sum up, I report 46 cases treated by prism exercise; of these 30 are apparently cured, 9 are benefited more or less. In three cases the result is unknown and in four cases no benefit at all was noticed. It is sometimes difficult to get a patient to exercise diligently and faithfully, and in some of my cases I attribute the failure of full benefit to the lack of obedience to instruction. All of the cases reported were examined under full cycloplegia unless age rendered it unnecessary; none of them were put on exercises until the refractive correction had been given what I considered a good and fair trial, except in such cases in which the error was so small as to be insignificant or not discoverable, or in which the muscular error was clearly the cause of the disturbance. In such cases the exercises were instituted at once and such correction of refraction ordered as was suitable. In the cases reported no hyperphoria of more than one-half degree was discoverable, my experience being that but little good will be accomplished by exercise with an uncorrected hyperphoria of one degree or over, but that in properly selected cases of weakened adduction a cure can be expected in nearly every instsnce by wisely supervised prism exercise.

CASE. DATE.	NAME. AGE.	SYMPTOMS.	REFRACTION.	VAR.	ABD.	ADD.	TREATMENT.	REMARKS.	RESULT.
I. 6-2-92	Dr. J. M. K. 30	Asthenopia. Headache after reading. Vague pains in legs. Distressing nightmare.	R. E. +1.00 Cy. Ax. 60° L. E. +1.00 Cy. Ax. 90°	Ex. 3	10	20	Full correction of refractive error. Eighteen months later Prism exercise.	Refractive correction improved condition, but nightmare and pain in legs continued. Prism exercise absolutely cured.	Cured.
II. 9-3-93	Annabel O'D. 20	Morning headache, inability to read or sew for more than a few minutes.	R. E. +1.50 Sp. ⊃ +0.50 Cy. Ax. 90° L. E. +1.25 Sp. ⊃ +0.50 Cy. Ax. 90°	Ex. 2	10	15	Refractive correction less +0.50 ea., 4-26-95. Prisms for exercise.	Considerable relief from refractive correction, but not cured. Prisms relieved in two weeks.	Cured.
III. 4-7-94	Mrs. W. E. M. 28	Asthenopia and smarting of eyes when read'g.	R. E. −0 50 L. E. Emmetropic.	Es. 2½		14	Prism exercise.	Prism exercise. Cured in six weeks.	Cured.
IV. 4-8-94	Miss E. B. B. 42	Emmetropic. Inability to read more than 10 minutes without pain and blurring.	Emmetropic.	Ex. 4	10	14	Prism exercise.	Relief began at once when able to overcome a pair of 10° prisms.	Cured.
V. 6-15-94	Mrs. W. B. 28	Asthenopia and blurring. Headache.	R. E. +0.50 ⊃ +0.75 Cy. Ax. 90° L. E. +0.75 ⊃ +0.50 Cy. Ax. 90°	Ex. 2	10	20	Refractive correction ordered less +0.25, 1-13-96 ordered prisms for exercise.	Symptoms disappeared for 18 months with refractive correction. Reappeared 1-13-96. Prism exercise cured by 3-15-96.	Cured.
VI. 9-12-94	Miss T. K. 16	Headache and asthenopia.	R. E. +1.50 Sp. L. E. +1.50 Sp.	Ex. 6	14	20	Ordered −1.00 Sp. ea., later prisms.	Refraction relieved somewhat. Exercises still more but passed from observation.	Cured.
VII. 9-25-94	Mrs. F. P. 35	Headache, and dizziness, spells of blurring. Catarrh of stomach.	R. E. +0.50 Cy. Ax. 90° L. E. +0.50 Cy. Ax. 90°	Ex. 1	8	15	Ordered cylinders and prism exercise.	Symptoms disappeared as adduction mussles gained in strength.	Relieved.
VIII. 11-27-94	George B. 34	Epilepsy. Headache and asthenopia.	R. E. +0.50 Cy. Ax. 60° L. E. +0.50 Cy. Ax. 90°	Ex. 2½	5	19	Ordered cylinders and prism exercise. Had been operated on in N.Y. by celebrated Neurologist. No relief of symptoms from oper'n.	Writes me that headache is better and that reading is easier; later that epileptic seizures are less frequent.	Benefited
IX. 1 8 95	Bessie S. 17	Headache, inability to work at her business because of pain in eyes and head.	R. E. −1.00 ⊃ −0.75 Cy. Ax. 165°. L. E. −1.00 ⊃ −0.75 Cy. Ax. 180°	Ex. 3	10	18	Ordered full refractive correction later, 5-4-96. Prism exercise.	Spectacles relieved for over a year, when symptoms returned. Prisms cured.	Cured.

X 1-11-95	R. S. T. 20	Inability to work at business as a retoucher because of pain in head and eyes,	(1) +1.50 Cy. Ax. 90° for both. (2) 1-26-96 +1.76 Cy, Ax. 90° for both	Es. 4	7	20	Refractive correction ordered, worn with comfort for a year. 2d formula ordered, symptoms no better. Prisms ordered, relief followed.	The symptoms disappeared in this case as the adductive muscles gained in power.	Cured
XI. 1-19-92	Belle Le V. 24	Headache and twitching of lids.	R. E. +0 50 Sp. L. E. +0.50 Cy. Ax. 180°	Ex. 1	9	21	Refractive correction in full, later prism exercise.	Spectacles paliated but did not cure, prism exercise cured.	Cured.
XII. 2-18-95	Mrs. J. H. F. 29	Headache and asthenopia.	+0.62 Sp. Ea,	Ex. 1	8	13	Ordered +0.50 Sp. ea. and prism exercises at once.		Cured.
XIII. 3-3-95	Miss E. M. H. 23	Constant headache and asthenopia.	R. E. +0.50 Cy. Ax. 45° L. E. +0.50 Cy. Ax. 165°	Ex. 5	14	18	3-3-95 ordered refractive correction 5-12-96 prism exercise.	Spectacles gave but little relief. Prism exercise reduced headache from being constant to about one in two weeks.	Much benefit'd
XIV. 4-2-96	Gertrude S. 16	Headache and asthenopia.	R- E —0.75 Cy. Ax. 5° L. E. 0.50 Sp.	Ex. 1	10	18	Ordered full correction 6-1-96. Prism exercise.	Glasses relieved for a year, when symptoms returned. Prism exercise cured.	Cured.
XV. 5-4-95	Louise W. 17	Emmetropic. Temporal headache. Menstrual disturbances and constipation.	Emmetropic.	Ex. 3	12	14	5-11-95 partial tenotomy of left externus leaving 1° Exop. 5-29-95 ditto left, leaving orthophoria.	But little result from either operation. Adduction not increased to any extent by operation. Prism exercises brought add. up to 50. Completely relieved.	Cured.
XVI. 7-11-95	Mina F. 30	Pain in occiput. Eyes smart and burn. Print blurs.	R. E. +0 75 ⊂ +0.75 Cy. Ax. 75° R E. +0.75 ⊂ +0.50 Cy. Ax. 135°	Ex. 1	8	20	Pain in occiput. Eyes smart and burn. Print blurs. Ord. refractive correction less +0.37 Sp. ea. Later prism exercise.	Spectacles afforded some relief, but not total. Prism exercise resulted in complete cure.	Cured.
XVII. 7-24-95	Mary S. 21	Complains of pain in forehead and back of neck after reading or sewing.	R. E. +0.25 Sp. ⊂ +0.25 Cy. Ax. 75° L. E. +0.37 Cy. Ax. 90°	Orth.	8	18	Ordered cylinders for astigmatism, lat'r prisms.	No effect from correction of astigmatism. Symptoms disappeared as adduction increased.	Cured.
XVIII 9-9 95	Mrs. H. S 28	Headache after reading. Panorama headache.	Emmetropic.	Ex. 1½	10	20	Prism exercise.	Headache disappeared as power of adduction increased.	Cured.

Case. Date.	Name. Age.	Symptoms.	Refraction.	Var.	Abd.	Add.	Treatment.	Remarks.	Result.
XIX. 9-21-95	Mrs. J. F. G. 24	Continued pain through temporal region.	R. E. +0.87 Sp. L. E. +0.62 Sp. ○ +0.25 Cy. Ax. 105°	Ex. 16	20	6	Ordered lenses less 0.25 Sp. ea. Partial tenotomy of R. ext. rectus. Prism exercise immediately following.	Headache much lessened. Adduction when last seen, 30. Patient passed from observation.	Benefited
XX. 11-5-95	Miss M. D. 53	Headache and pain in eyes and back of neck.	R. E. —0.75 Sp. ○ —2.75 Cy. Ax. 30° L. E. —2.00 Cy. Ax. 150°.	Ex. 2	10	14	Ordered lenses for distance and added +2.25 Sp. for reading. Prism exercise later.	Glasses relieved pain in eyes but not pain in neck Prism exercise did completely.	Cured.
XXI. 11-9-95	Louise S. 21	Eyes ache. lids burn and head aches.	R. E. +0.37 Sp. L. E. +0.50 Sp.	Orth.	6	20	Full correction by lenses. Prism exercises later.	Glasses gave some relief. Prisms completed cure.	Cured.
XXII. 12-17-95	Albert K. 18	Eyes ache, smart and burn. Cannot read over half an hour.	R. and L. +0.75 Sp.	Ex. 4	12	12	+0.50 Sp. ea. and prism exercise.		Cured.
XXIII. 12-21-95	Mrs. T. B. S. 52	Has suffered with headache all her life. Always gets up with headache. Is extremely hysterical.	R. E. +0.37 Cy. Ax. 180° L. E. +0,37 Cy. Ax. 180°	Ex. 2	7	15	Cyl. as indicated with + 2.00 Sp. for presbyopia and prism exercise.	Not much result obtained in this case. Patient has been invalid all her life and would apparently prefer to remain so.	None.
XXIV. 1-1-96	B. F. F. 25	Dizziness, pain and redness of eyes. Eyes ache after work. Headache over eyes and in occiput.	R. E. +0.50 Cy. Ax. 10° L. E. +0.50 Cy. Ax. 170°	Ex. 1	10	13	Ordered cylinders and prism exercise.	Patient improved rapidly under exercise but left city and has not been heard from lately,	Benefited
XXV. 1-10-96	A. R. P. 31	Close work caused pain in eyes. Reddened lids.	R. E. +0.25 Cy. Ax. 90° L. E. +0.25 Cy. Ax. 180°	Ex. 6	12	12	Ordered prism exercise.	Patient was entirely relieved when adduction reached 30.	Cured.
XXVI. 2-18-96	Dr. A. H. C. 26	Eyes blur when reading.	Wearing +1.00 Sp. ○ +25 Cy. Ax: 90° ea.	Ex. 2	6	15	Ordered prism exercise.	Dr. C. reports that the exercises helped him immediately and that reading became easy.	Cured.
XXVII. 2-27-96	Mrs. W. C. C. 21	Is a neurasthenic: headache in occiput and vertex.	R. E. +1.12 Sp. L. E. +1,12 Sp.	Ex. 1	9	30	Ordered +87 Sp. ea. and later prism exercise.	Was somewhat relieved by glasses, prism exercise accomplished nothing.	No benefit.

XXVIII. 3-8-96	Rose K. 19	Eyes get tired after reading and sewing, etc. Cannot read in evening. Headache.	R. E. +0.62 ⊂ +0.37 Cy. Ax. 90° L. E. +0.50 ⊂ +0.25 Cy. Ax. 75°	Ex. 1	10	18	Ordered full correction less +0.25 Sp. Later prism exercise.	But little relief until prism exercise was instituted, then rapid improvement.	Cured.
XXIX. 3-17-96	Amelia S. 36	Panorama headache.	R. E. +0.25 ⊂ +0.75 Cy. Ax. 60° L. E. the same.	Ex. 2	8	20	Ordered cylinders, later prism exercise.	Much benefited by both measures, but not cured,	Benefited
XXX. 3-26-96	Mrs. H. D. 42	Panorama headache and difficulty in reading and sewing.	R. E. +0.62 Cy. Ax. 75° L. E. +0.62 Sp.	Ex. 3	12	20	Ordered glasses for constant wear and prism exercise.	Headache ceased when adduction became normal.	Cured.
XXXI. 3-26-96	F. H. 19	Temporal headache.	R. E. —0.12 ⊂ —0.37 Cy. Ax. 75° L. E. —0.25 Sp.	Ex. 1	10	16	Spectacles and prism exercise.		Unknown.
XXXII. -16-96	Mrs. T. M. 36	Contin'l headache. Sick headache two or three times a week. Unable to read or sew without pain in eyes.	R. E. —0.37 Sp. ⊂ +0.62 Cy. Ax. 60° L. E. —0.12 ⊂ +0.37 Cy. Ax. 90°	Per Div. Stra.		6	Ordered full refractive correction. Pencil exercises, later prism exercise.	Headache lessened as converging power increased. Before discharged as cured could overcome a pair of 30 prisms easily.	Cured.
XXXIII. 4-28-96	Miss A. C, 26	Complained of weakness of eyes. Is very hysterical.	R. E. —0.50 ⊂ +1.00 Cy. Ax. 96° L. E. —1.00 ⊂ +1.75 Cy. Ax. 75°	Ex. 3	12	16	Ordered refractive correction and prism exercise.	Patient would neither wear glasses nor exercise, so was dismissed.	None.
XXIV. 7-1-96	E. S. 19	Continued headache for years. Eyes ache in light.	R. E. —0.25 Cy. Ax. 90° L. E. —0.25 Cy. Ax. 180°	Per Div. Stra.			Tenotomy (partial) of R. ext. rect., later tenotomy followed by prism exercise.	Relief after first tenotomy for a month, when headache returned. 2d tenotomy followed by prism exercise and result obtained by operation made permanent.	Cured.
XXXV. 7-9-96	Miss S. A. 27	Headache and asthenopia.	R. E. +1.25 ⊂ +0.50 Cy. Ax. 120° L. E. +1.25 ⊂ +0.50 Cy. Ax. 60°	Ex. ½	8	15	Ordered spectacles, later prism exercises.	Spectacles did not give absolute relief. Prism exercise benefited but did not cure.	Benefited
XXXVI. 7-9-96	Mrs. G. C. 29	Const't headache, rel'vd. by +1.25 Cy. Ax. 90, prescribed by another oculist 1893. Since return'd.	R. E. +0.50 Sp. ⊂ +1.50 Cy. Ax. 90° L. E. +0.75 Sp. ⊂ +1.25 Cy. Ax. 90°	Es. 2	10	18	Ordered myrefraction less + 0.50 ea., later prism exercise.	Change of lenses did not affect headache. Prism exercise cured.	Cured.
XXXVII. 7-14-96	Mrs. W. S. K. 38.	Headache in forehead, temples and occiput for many years. Keeps getting worse.	R. E. —0.50 ⊂ +2.00 Cy. Ax. 90° L. E. —0.50 ⊂ +2.00 Cy. Ax. 90°	Ex. 4	12	22	Ordered full correction 8-27-96. Prism exercise.	Very much relieved by spectacles but not cured. Prism exercise finally cured.	Cured.

CASE. DATE	NAME. AGE.	SYMPTOMS.	REFRACTION.	VAR.	ABD.	ADD.	TREATMENT.	REMARKS.	RESULT.
XXXVIII 7-16-96	Mrs. J. H. D. 56	Eyes smart and pain in back of neck.	R. E. —0.12 ⊃ —0.25 Cy. Ax. 180° R. E. Emmetropic.	Ex. ½	8	16	Ordered presbyopic correction and prism exercise.	Pain in back of neck absolutely ceased.	Cured.
XXXIX. 7-23-96	Mrs. G. S. 25	Pain over left so severe as to compel patient to go to bed. Cannot see to sew or read.	R. E. +0.12 ⊃ +0.50 Cy. Ax. 90° L. E. +0.50 Cy. Ax. 90°	Ex. 3	12	18	Cylinders ordered as indicated. Prism exercise.	Glasses had no effect on headache but prism exercise relieved as adduction increased.	Cured.
XL. 7-27-96	Mrs. B. L. A. 25	Frontal, temporal and vertical headache.	R. E. +0.50 Sp. L. E. +0.50 Sp.	Ex. 1½	9	20	Ordered +0.50 ea. and exercise.	Patient lives out of town and has not reported.	Unknown.
XLI. 7-29-96	Elsie B. 13	Soreness of eyes. Frequent headache.	R. E. +0.25 Sp. L. E. +0.50 Sp.	Ex. 1	10	18	Prism exercise.	Out of town patient.	Benefited
XLII. 7-29-96	Mrs. C. A. M. 43	Temporal headache. Failure of vision.	R. E. +0.37 Cy. Ax. 45 L. E. +0.50 Sp. ⊃ +62 Cy. Ax. 150°	Ex. 1½			Refractive error corrected and presbyopic correction added. Ordered prism exercise.	Patient never reported.	Unknown.
XLIII. 7-30-96	Dr. J. E. B. 28	Thinks glasses which were fitted in Philadelphia were not right, as vision becomes blur'd.	R. E. —0.75 Cy. Ax. 120° L. E. —1.00 Cy. Ax. 60°	Ex. 1		20	Glasses confirmed. Ordered prism exercise.	Dr. B. reports that eyes improved as his adduction increased.	Cured.
XLIV. 8-3-96	Mrs. G. E. S. 28	Panorama headache. Eyes tire easily.	R. E. +0.50 ⊃ +0.50 Cy. Ax. 90° L. E. +0.50 ⊃ +0.50 Cy. Ax. 75°	Ex. 3	11	22	Cylinders ordered and prism exercise.		Cured.
XLV. 8-18-96	Mrs. J. H. R. 35	Complains of bad feeling back of neck. Cannot read long.	R. E. +0.62 Cy. Ax. 90° L. E. +0.50 Cy. Ax. 90°	Ex. ½	8	18	Prescribed cylinders and prism exercise.	Latest report patient is feeling better.*	Benefited †
XLVI. 8-18-96	Mrs. L. S. 42	Constant headache over eyes.	R. E. +0.37 Cy. Ax. 75 L. E. 0.37 Sp.	Ex. 1	8	16	Glasses for distance and reading ordered.	Would not practice.	No benefit.

* 11-7-96. Patient reports pain in neck entirely gone.
† Cured.

GLAUCOMA; ITS SYMPTOMS, VARIETIES, PATHOLOGY AND TREATMENT.

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ATLANTA, GEORGIA.

Illustrated.

(Continued from Vol. V., No. 4.)

seen, constant, and which gives the fundamental picture in primary Glaucoma, is glaucomatous papillitis." It "has a peculiar and characteristic aspect; the papilla becomes soft, slightly oedematous, reddish yellow and then a grayish yellow, which gives it a resemblance to the papillitis of retinitis pigmentosa. The arteries are already contracted and the veins dilated. The inflammatory process reaches, to some extent the peripapillary choroid. The papilla soon begins to cup, the vessels form little curves " etc. This papillitis is seen, according to this author, by chance when examining healthy eyes or when the other eye is already glaucomatous. The vision and the visual field are both subnormal, there is no increase of tension if the stage of cupping has not begun, which takes place about two months after the beginning of the papillitis. Then the oedema diminishes, the papilla becomes grayer, and *plus* tension appears. He says, "it seems to me that one can accept as an absolutely certain fact that the glaucoma has begun by a papillitis constituting a lesion which is primary and at the same time fundamental"; and, "we do not meet with commencing glaucoma without a papillitis, more or less marked when seen from the beginning. Further the Glaucoma begins by a papillitis on one side when that on the other is already advanced. Besides, the glaucomas, which begin under our eyes in the form of papillitis are the most distinct and incontestable; finally, pathological anatomy proves to us that optic-neuritis is a very early lesion of Glaucoma, and that it forms the only constant lesion." Zentmayer and Campbell Posey (10), in discussing 167 cases of simple Glaucoma found in the books of the clinics of Drs. Norris and Oliver at the Wills Eye Hospital, Philadelphia, conclude that "an inflammation of the optic nerve is a constant attendant upon Glaucoma, being noted in every eye containing a pathologic excavation. It manifests itself as a low-grade neuritis, affecting the entire structure of the nerve, and seems to render the nervous tissue more liable to the peculiar kind of excavation which is the most constant characteristic of Glaucoma." These words may be mistaken as meaning that these authors have ground for the assertion that the other glaucomatous symptoms follow, and possibly even result from, optic neuritis; but, from a careful consideration of their previous statements, no such conclusion appears tenable, and all that can be fairly deduced is that along with, or as the result of, other glaucomatous symptoms the optic nerve also in Glaucoma is abnormal. This subject has an important bearing on the question of the etiology of glaucoma, in which section it will come up again for consideration.

Cupped Disc.

It is usual to describe three forms of cupping of the optic disc, which it is important to distinguish from one another. These are called physiological, atrophic, and glaucomatous cups.

The Phsysiological Cup

Is exceedingly common, and is the result of the early separation, after passing through the lamina cribrosa, of the fibres of the nerve on their way to divide up for the formation of the retina. It is therefore shaped rather like a flower vase than a cup, narrow below and opening up widely at the mouth, and the retinal vessels can be followed all the way down its sloping walls. It occupies only a portion of the disc not usually central, but more often to the temporal side. It is paler than the remainder of the disc. On section the lamina cribrosa is found to be at its proper level. These cups are always bi-lateral.

The Atrophic Cup

Is formed by the disappearance of more or less of the nerve structure in front of the lamina cribrosa, which retains its normal level, and limits the depth of the depression. It is shaped like a shallow saucer, modified, of course, by the original physiological form of the disc, and the vessels are visible during their entire course upon the disc. The whole of the disc is usually effected, and the perforations of the lamina cribrosa are often unnaturally distinct.

The Glaucomatous Cup

Differs from each of the preceding, chiefly on account of the depressed level of the fenestrated membrane, which fills up the optic foramen in the sclera, and through which the nerve passes—the lamina cribrosa. Its depth is therefore greater; and, moreover, in cases of some duration the sides are undermined so that the vessels after curving sharply over the edges of the disc disappear from view only to become visible again at the bottom of the cup. It appears as if the high intra-ocular pressure had excavated the head of the nerve as far as possible in every direction. The lamina cribrosa being delicate early yields before it, and the undermining of the sides, a later stage, is facilitated by the fact that the scleral foramen through which the nerve passes is wider behind than it is in front. The nerve tissue has first a full color, becomes later pale and atrophic, and the vessels are pressed hard against the lips and the walls of the cup, leaving ultimately only a narrow rim to represent what had been the normal position of the disc. In advanced cases the visible vessels are found to be congregated chiefly at the side. The bottom of the cup is not to be seen distinctly with the lens suitable for the level of the retina, a lower plus or higher *minus* being required, and its depth may be measured by allowing 3 dioptres for each millimeter of difference. The inequality of depth can be proved also by noting the parallactic movements which occur when the observer, using the direct

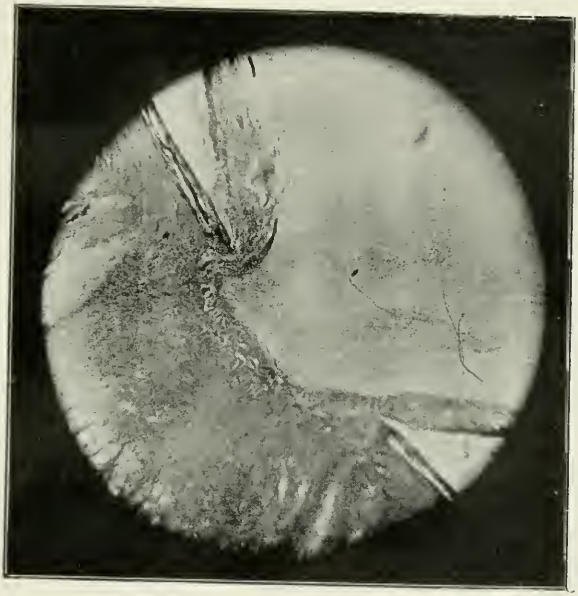

Fig. 2.—Glaucoma Cup. The nerve tissue is atrophied, the lamina cribrosa driven back, and the side excavated.

Most of the illustrations in this work were first photographed from sections of eyes removed in Moorfield's Hospital, London, and prepared in the laboratory there under the supervision of Mr. Treacher Collins.

method, changes the point from which he views the fundus; or, with the indirect method, when he moves his object lens.

In late stages, as already said, the cup has been observed to fill up again by the formation of new tissue in it (Brailey, Pagenstecher, etc.), and it has also been seen to be completely filled with blood (Hartridge, 11; Morton, 12).

It should be noted that occasionally the disc is cupped in a manner "almost typical" of Glaucoma, "with normal vision and visual field, and without another symptom of Glaucoma;" but Nettleship (13) says of these cases, "we cannot but be very careful in inferring that a person whose discs show changes resembling those of Glaucoma, is really safe, however free he may be from the symptoms and other signs of the disease."

Mackenzie (14) seems to have been the first to note the change in level of the optic disc in Glaucoma, for he said, in 1854, "In this, as well as in another case which I had an opportunity of examining after death, the optic nerves were flattened and atrophic." In the same year, Jaeger (15) noted the peculiarity of the disc, with the ophthalmoscope, and he, and v. Graefe also, expecting to find signs of inflammation, mistook it for a swelling, and the latter (16) said of it, "the change in the opticus, which has already been carefully studied and illustrated by several observers, especially by Ed. Jaeger, consists in that the optic nerve entrance shows in nearly its complete circumference a strongly marked round elevation, and only a thin peripheral zone lies at the natural level of the retina which borders closely on the elevation like a ring laid round its base." The following year Adolph Weber (17) demonstrated how such mistakes might be avoided by noting parallactic movements on the fundus, and the lenses required to focus the different depths. Desmarres (18) wrote in 1858, "One thought at first that the papilla of the optic nerve became convex in Glaucoma. Since then one has recognized that, on the contrary, it is concave." In the same year Mueller (19) repeated on an excised eye the observation made four years earlier by Mackenzie, and said, the disc "forms a concavity from whose border the retina rises up perpendicularly. The walls of the pit sink from above through the normal choroidal ring, at first very steeply, so much so that in many places the border somewhat overhangs." The symptom thus brought to the notice of the profession has since by most ophthalmologists been ascribed to the simple mechanical pressure of the intraocular tissue pushing back the lamina cribrosa, which is the weakest part of the globe, and at the same time, causing atrophy and sclerosis (Brailey and Edmunds, 20) of the nerve fibres, here entering the eye, which still farther enlarges the excavation. v. Graefe (21) in 1862 asserted that "every increase of tension, influencing the conductibility of the retina, leads also to a *characteristic* excavation of the optic nerve.'' In 1875 Schmidt Rimpler remarked that the cup was "characteristically glaucomatous when the lamina cribrosa had been pushed back." Schoeler (22) in 1879, by cauterizing the corneo-scleral limbus, produced T + 2 or T + 3, which quickly caused the papilla to blanch, the arteries and veins becoming almost invisible throughout or only at their central ends, and running to the periphery as fine pale red lines; the more marked the increase of tension the less are the vessels visible." The short-lived tension produced by these experiments Schoeler asserts to have been sometimes sufficient to excavate the disc.

Priestley Smith (23) says that "there is ample evidence that the typical excavation of the papilla—the glaucoma cup—is a product of high pressure. It is to be found, by dissection or otherwise, in every eye which has suffered long or frequently from high tension. It is not to be found after a very brief period of high tension, for the excavation involves atrophic changes which need time for their development, but even in such cases the microscope shows the first step of the process—a pushing back of the lamina cribrosa; and even in the healthy excised eye high pressure artificially applied causes the same displacement," and again (23) "it is not a purely mechanical result of pressure; it includes atrophic changes, which, though essentially due to pressure take time for their development;" also, "when the excavation of a disc proceeds very slowly the damage done to the nerve fibres and the corresponding impairment of the field are sometimes very slight as compared with the depth of the cup" (23). "It is possible of course that a similar excavation may arise from causes other than an excess of pressure. Should this prove to be the case, it will be well to give such cases some name other than Glaucoma."

Treacher Collins (24) wrote, "The seat of entrance of the optic nerve is a weak point in the walls of the eye, and the lamina cribrosa early becomes depressed backwards. This depression backwards of the lamina cribrosa, together with atrophy of the nerve fibres, causes cupping of the optic nerve." These words express the general opinion of ophthalmic pathologists, and they are supported by a consideration of the fact that cupping is found in cases of secondary glaucoma distinctly due to some fault in the anterior part of the eye, as from dislocation of lens (Treacher Collins 24), from serous iritis, or in buphthalmia from hereditary malformation of the anterior chamber. It will be observed, that among others, the authors just quoted, make no mention of a morbid condition of the optic nerve antecedent to the pressure, but that they imply that any changes in the disc, peculiar to the glaucoma process, are secondary to the increase of intra-ocular tension.

On the other hand, cases have been reported in which there was cupping but no *plus* tension, others in which there was long continued high tension without cupping; and still others in which the high tension was known to have been preceded by a morbid state of the papilla considered to have been of more importance in the production of the cupping than was high tension, which, however, always followed. In connection with this last class, we have already seen, that Jaeger, Klein, Brailey, Edmunds, Mauthner and Bitzos have distinctly stated their opinion that a morbid process attacks the nerve head before the appearance of plus tension; whilst, among others Gruening, Knies, and Fuchs consider that an unnatural condition of the disc is one of the earliest symptoms of Glaucoma, though I cannot include them among those who hold that the appearance is actually anterior to the increase of tension. Mauthner farther wrote: "At the beginning of the excavation pressure is often not raised." . . . "A morbid process attacks and softens the lamina cribrosa and optic nerve so that the lamina yields to normal pressure; the supporting tissue of the optic nerve gives way, the fibres of the optic nerve become extraordinarily transparent, and on the other hand the vessels sink backwards into the transparent head of the optic nerve. Thus it seems as if the latter were pressed close to the scleral ring while the masses of nerve fibres covering them cannot be seen directly with the mirror." He supported this theory by stating that he had found transparent matter in the cup after excision of the eye. The atrophy, he remarked, was undoubtedly increased by heightened tension. The peculiar convoluted vessels sometimes seen at the bottom of the cup were new formations in connection with the morbid process. Mauthner admitted that the explanation was very forced, and said that he would welcome a better.

Bitzos (26) conceded that, as ordinary "optic neuritis does not render the lamina cribrosa more feeble or produce *plus* tension, we must suppose something peculiar about glaucomatous optic neuritis, yet the disc begins to cup and the vessels to curve without doubt before plus tension appears, but these things become more marked on account of *plus* tension."

Glaucomatous Excavation without Increased Tension.

It has long been known that typical glaucomatous cups may exist without any apparent increase in intra-ocular tension; for example, Schmidt-Rimpler (27) mentioned this in 1875, and stated that the optic nerve fibres, at first normal, later become atrophic. Schnabel (28) reported a case* of glaucoma seen in an early stage and without cupping, on which he performed iridectomy, with the result that there was no longer plus tension, and yet a typical cup afterwards formed without, however, any further reduction of vision. Nettleship (29) said "the tension in the quietest forms is sometimes never perceptibly increased," and "the depth of the excavation bears no constant relation either to the atrophic pallor of the disc or to the degree of tension of the eye." Stedman Bull (30) in 90 cases of simple glaucoma, found in both eyes normal tension in only two cases. Knies (31) said, "the cup is known to appear without plus tension, and with quite good vision." Nettleship (32) had already discussed the relationship existing between glaucoma and excavations appearing in eyes in which there had previously existed large physiological cups, and expressed himself with considerable caution on the subject, but Schweigger (33), at a later date, in connection with these cases, asserted his absolute belief that they are not glaucomatous at all, but are due to atrophy; in glaucoma there must always be perceptible increase of tension. (For further discussion of this topic, see Diagnosis.) Chauvel (34) expressed a very commonly accepted opinion when he said, "One ought to look upon the *plus* tension as a necessary condition, only in chronic cases it is hard to feel it, as the eye gradually fits itself to the altered pressure." Priestley Smith (35) maintained that the hypothesis is unnecessary which assumes that glaucoma "is the expression of some unknown agent which usually raises the pressure and excavates the disc at the same time, but which occasionally excavates the disc without raising the pressure." And, he continued, "it is very probable, therefore, that these cases of glaucoma with normal tension are cases which have been examined only during the intermissions.

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*It may be observed in connection with this case, that previous high ension might have so weakened the lamina cribrosa as to make it unable o resist a normal amount of pressure of increased tension.

Increased Tension Without Cupping.

A few cases have been recorded in which, after even a very considerable time, there was no cupping. The length of time necessary for the formation of a pressure cup is given very variously by different authors. Mauthner (36), for instance, went so far as to assert that glaucoma may become "absolute" without cupping, and he had seen cases of chronic inflammatory and of simple glaucoma which after a year's duration showed no cup; but he gave no account of any microscopic examination of the condition of the lamina cribrosa. In contra-distinction to this Schoeler has found cupping in rabbits' eyes after an artificially produced T + 2 or 3 of some two hours' duration. We have seen that certain writers believe the cupping to precede the *plus* tension; and Bitzos (37) asserted that the cupping begins about two months after the first appearance of papillitis. In glaucoma fulminans the eye may be blinded in a few hours or less, and without cupping, and operation may cure high tension while leaving the eye blind and without cupping, as in a case of Mauthner's of six days' duration, and one of Rydel's of three weeks' duration. Brailey (38) reported a case of very high tension for nine days in which no cup was found microscopically. He had previously reported a case of six weeks' duration, T + 3, at the time of the excision, where there was a pitting of the nerve, but not yet any lateral excavation, and another, T + 2, at the time of the excision, of five months' duration, with a wide and shallow cup, but no lateral excavation. "I find no case with a cup whose edges are distinctly undermined without a history of at least two years, and in many cases with a history of seven or more years, and T+1 at excision, the cup is neither deep nor undermined laterally." Knies asserted that it takes weeks for the hyperaemia of the disc to pass into cupping, and Schweigger (40), "as far as my observation goes the excavation of a level disc proceeds for at least six months before it actually reaches the papillary border." Priestley Smith (41) wrote, "cupping of the disc is not to be discovered during or after a first attack of acute glaucoma, unless the outbreak has been preceded by a chronic excess of pressure of some months' duration," but depression of the lamina cribrosa may be found. Treacher Collins' (42) report on the glaucomatous eye in the Moorfields hospital museum, Case VIII, is described as exhibiting cupping after a raised tension of five months' duration: and Case XVII, one of haemorrhagic glaucoma, after two and a half months V. Garnier (43), reported a case of *plus* tension of six weeks' duration occurring after a traumatic cataract caused by a powder explosion, in which examination showed a deep cup up to the margin of the disc.

One is safe to conclude from the above examples of what has been written on the subject, that cupping of the disc is an invariable result of the glaucomatous process when that has existed for a certain, though indefinite, time, the exceptional cases being, as Priestley Smith remarks, those in which the disc has been protected by a new growth.

The Halo Glaucomatosus.

A white circle surrounding the disc is usually held to be due to atrophy of the choroid, the result of pressure: and occasionally the retina, choroid, and sclera have been found united in that region by adhesions (Knies). Mauthner considered this to be part of the process affecting choroid and disc which, in his opinion, was the cause of the excavation, the choroidal atrophy following an exudation under it. When it appears early it is probably as a result of such exudation.

Pain

In the eye and head is the result of pressure on the ciliary branches of the 5th nerve, especially in the ciliary body and iris, the sensation being transferred from the actual seat of the disease to other regions supplied by the nerve, and especially by its first and second branches. It seems reasonable to suppose that the dragging on the zonule, due to the forward pressure of the lens, and the nipping of the iris and ciliary processes between the lens and sclera, may be a common cause of pain.

The Frequently Rapid Advance of Presbyopia

is said to result from pressure interference with the action of the third nerve on the ciliary muscle; to a tension of the choroid from stretching, due to the internal pressure, which interferes with the power of the ciliary muscle in drawing it forward for the purpose of accommodation (Priestley Smith); to a diminution of the refraction from a nearer approach of the eye to a globular shape (Swanzy, 46); while the rapid atrophy of the ciliary muscle, said by Brailey to be an early result of the glaucoma process, might have been brought forward to account for this symptom.

The Photopsia,

which is sometimes complained of even when the patient is quite blind, is in all probability the result of violent stimulation of visual nerve fibres, caused by a stretching or dragging of the retina.

The Disorganization,

which follows upon glaucoma absolutum, consists in a degeneration of the various tissues, with an alteration in the shape of the globe, which tends to become square from bulging between the recti. The cornea is now likely to show one or other of the following appearances: Bullae, due to the raising up of the epithelium by serum below it; superficial opacity of the whole cornea, along with one more deeply seated and limited in extent; ulceration, or abscess, perhaps with perforation; "transverse films." The removal of epithelium, which occurs so easily when it is elevated by exudation beneath, facilitates the entrance of infective material, which may result finally in panophthalmitis. The lens becomes cataractous and often calcareous, and a band of hyaline globules has been found to cross its nucleus (Treacher Collins). The atrophy in the ciliary region causes the vitreous to shrink and become detached from the retina. Degenerated vessels in the retina give rise, not infrequently, to haemorrhages into its substance, and occasionally it becomes detached from the choroid from one or other of various causes—the previous shrinkage of the vitreous; haemorrhages, from changes in the vascular walls rendering them brittle; dragging of organizing inflammatory products; or, as Knies suggested, shrinking of the membrana limitans interna.

The Deterioration of Vision.

Temporary deterioration in visual acuity is no doubt caused by the hazy condition of the cornea, and possibly of the aqueous, together with the interference with the retinal nervous functions, probably the result of choroidal oedema, due to intra-ocular pressure. Schnabel thought the reduction of vision to result from spasmodic contraction of retinal vessels. When the visual nerve fibres have become organically deteriorated, the resulting interference with sight is permanent. Along with diminished acuity of central vision is found a contraction of the visual field which was first observed by Mackenzie, but first studied by Hoffmans under the guidance of Donders, the results being published in Dutch in 1860 (Snellen, 48). In acute cases this contraction is comparatively not so apparent as is the general haziness of vision affecting the retina as a whole; but in those which are more chronic, and in which the tissues gradually accustom themselves to new conditions, even to considerable excavation of the disc, the central vision may remain fairly good, while parts of the periphery are more or less blind. Most frequently it is the nasal side which earliest and chiefly suffers, but this is by no means constant. Thus, Bunge (49) found in 100 cases a defect in the nasal side alone in 27; predominating in the nasal portion in 44; field remaining in the form of an oval around the papilla in 4; in 9 cases the whole field was destroyed, center included, except a small portion on the temporal side, a central or paracentral scotoma, with or without some nasal contraction in 4; contraction upwards alone, in 2 cases; concentric restriction, in 6; restriction, chiefly in temporal side, in 2 cases. The contraction of the field for colors starting each from its own normal, proceeds as a rule *pari passu* with that for white, or at most a little faster, which is worthy of note as a point of difference between Glaucoma and optic atrophy. The precise cause of the glaucomatous restriction of the field is not yet definitely settled. It is probably due either to the fibres in the optic nerve destined for the peripheral zone of the retina being more exposed to damage at their entrance into the eye (the central nerve fibres, according to Bunge, though Donders thought that the nerve fibres for the periphery lay most superficial in the nerve trunk, and were therefore most exposed) or, because the more distal vessels are smaller and more susceptible to pressure, and especially on the temporal side where the vascular supply is weakest; or, because oedema affecting the retina would naturally be most marked at the greatest distance from the vascular centre. It is evident, in any case, from the variety in the forms of the field, either that the anatomical relationships of the tissues involved are inconstant, or that the cause is not always one and the same.

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CHAPTER III.

ETIOLOGY.—GENERAL CONSIDERATIONS.

Until Helmholz, in 1851, armed the profession with the ophthalmoscope, it was working in the matter of glaucoma, literally in the dark. Then a new interest was given to the subject, which was materially enhanced five years later, when Graefe showed by his use of iridectomy that this previously practically incurable disease was susceptible of beneficial treatment.

Physicians in the olden times were acquainted with the later stages of glaucoma, but it was only comparatively recently that the differential diagnosis between it and other diseases, especially cataract, was placed upon anything like a sure foundation.

Hippocrates comprehended under the term glaucoma every sort of opacity which appears behind the pupil, but he distinguished varieties of these without knowing in what the differences consisted. The later Greeks called incurable opacities γλαυκωαα while the more favorable they named ῦπσχsαμὰ the former depending on changes in the lens, and the latter on an accumulation between the iris and the lens. "Abundant proof could be brought that these were the doctrines of Galen in 1538, and of Rufus in 1557" (Mackenzie, 1), and that no advance had been made down to the time of Brisseau, in 1709. "Even Maitre-Jan (in 1711), to whom we are, in a great measure, indebted for establishing by dissection the fact that cataract is, in general, an opacity of the crystalline lens, and not a filmy substance between that body and the iris, still maintained that glaucoma was also a disease of the lens, "a peculiar alteration in the lens, by which it dries up, diminishes in volume, changes its color, and loses its transparency, whilst preserving its natural shape, and becoming more solid than it ought to be naturally." (Mackenzie, 1) Maréchal's examination of the eyes of Dr. Bourdelot, physician to Louis XIV, and the fact that couching did not relieve the condition, were the foundations for Brisseau's assertion in 1709 that glaucoma is a disease of the vitreous such as cataract is of the lens. Boerhaave, (2) in his treatise on Diseases of the Eye, published in Paris in 1748, still included glaucoma under the heading of cataracts. "Pains, great, profound, pertinacious and of long duration, at the fundus of the eye, produce sometimes a cataract; then, finally, the brilliance of the eye disappears and an opaque appearance takes its place, when the cataract is fully developed. . . . If the humor collected there changes its color into yellow, green, black, etc., it will be a spurious cataract, but such cataracts were never willingly touched by any of the ancients. . . . Hence arise two separate conditions,—in some persons the iris remains mobile with vision; in others it becomes immobile with blindness." Later, the idea, quoted by Beer, who also considered the disease arthritic in nature, that glaucoma is a disease of the vitreous, gained ground; Wardrop, for instance, writing in 1818, that the "vitreous humor acquired a dull, greenish color, accompanied with insensibility of the retina, a species of amaurosis." Prof. Rosas, of Vienna, in 1834, described three varieties, glaucoma of the hyloid, of the retina, and of the choroid, and Mackenzie asserted in 1854 that the general idea still remained that glaucoma is a disease of the vitreous. Mackenzie, himself, however, held otherwise, and described it as an inflammation of the choroid from whose internal surface effusion takes place, the retina being compressed, and the vitreous disorganized and replaced by superabundant watery secretion. "It is probable that the aqueous fluid which fills the place of the vitreous humor, becoming superabundant, promotes by pressure the absorption of the pigmentum nigrum, and completes the insensibility of the already disordered retina."

MacKenzie may be said to be the link which connects the days of ignorance and guess-work in the pathology of glaucoma with the modern days of scientific research. He was evidently the first to observe the glaucoma cup, while as early as 1830 he had drawn attention to the hardness of the globe and its importance, and on that basis he performed the operations of sclerotomy, and of paracentesis of the cornea, although usually with only temporary success. But how far he had advanced is seen when we remember that his idea of the choroidal origin of glaucoma, though still mingled with some old-time notions, was closely allied to what has been held down to the present time by many eminent authorities possessed of modern microscopes, brought up to the use of the ophthalmoscope, and in full knowledge of iridectomy; while the common accident of the prolapse of a piece of iris during his operation of opening the anterior chamber, with its subsequent excision, might have antedated the discovery of the best operative measures by over a quarter of a century. After the new methods had given new impetus to the study of glaucoma, novel ideas began to spring up in all directions, and many theories have since then been advanced to explain the symptoms of the disease, a short study of which is necessary in order to understand the present position of our knowledge of the subject.

It is held by the majority of ophthalmic surgeons that the increase of intra-ocular pressure found in glaucoma is responsible for all the evils which accrue to the eye from the disease; in other words, that the conditions giving rise to the high tension, and without the addition of the tension, would have comparatively slight results. Mackenzie (1), as already said, first observed it, appreciated its importance, and brought it before the notice of the profession. Bowman, in his lectures at the Ophthalmic Hospital, Moorfields, in 1847, made special note of the tension, and at the meeting of the British Medical Society in London, in 1862, he proposed certain formulae for recording its amount, which have since been generally adopted in the somewhat simplified form in which he had them afterwards printed (3): thus, T. n. means a normal tension; T. + 3, stony hardness, and T. + 1, and T. + 2, the degrees which intervene. T-3 is a perfectly soft and flabby eye, and T-1 and T-2 are intervening degrees of softness, while T. + ? and T-? mean conditions of uncertain hardness or softness. These have proved to be very valuable formulae, but it is evident that they are not exact, and differences of opinion are frequent concerning the same eye, due, generally, to the imperfection of the method, but at times, no doubt, to the fact that palpation of a hard eye not uncommonly has the effect of reducing the tension. Neither is there any definite standard of normal pressure, which, though the same for the two eyes of any individual, varies to some extent in different persons. Bowman's method, and the one generally in use, is, with a finger of each hand, the patient looking down, to palpate the eye through the upper lid, pressing alternately with each finger. This has the disadvantage that a varying thickness of lid is included in the examination, and to avoid it, Coccius (4) pulled down the lower lid and placed his fingers directly on the sclera. This is more uncomfortable for the patient, but is preferred by a few surgeons, Schweigger (5) among others. In order to get results more scientifically correct various inventors have constructed machines, but no one of them has yet come into general use. Among these are the "Tonometers" of Priestley Smith, Fick (6), Nicati, and Koster (7). The principles to be observed in constructing a tonometer have been set down by Priestley Smith (8). He adds, that no tonometer, "however ingeniously devised, can accurately measure the intra-ocular pressure, or accurately compare one eye with another," but the instrument which he has devised is useful in determining the changes which take place in one and the same eye, and also in comparing the two eyes of the same patient, for which purpose he habitually employs it.

The normal tension, measured by the manometer, is about 25 mm. of mercury, and is practically as great in the aqueous as in the vitreous chamber (Schoeler, 9, and Priestley Smith, 8). It is maintained by the intrinsic power of the eye automatically to regulate the amount of its fluid contents. In connection with this subject, it may be well briefly to describe the apparatus through which the ocular fluid circulates and the manner in which it acts. The eye is composed of a slightly elastic frame-work, tough, strong and dense, for the protection of its delicate contents, and to maintain its shape, the anterior part of which, the cornea, is transparent to permit the rays of light to reach the fundus. The sclera is lined by the first part of the uvea, the richly vascular choroid, expanding forward behind the level of the corneo-scleral junction into the second part of the uvea, the outer portion of which, formed by radial and circular muscular fibres is the ciliary muscle, and the inner, the ciliary body, is composed chiefly of blood-vessels. From the ciliary body projects the third part of the uvea, the iris or curtain of the eye, which by reflex action regulates the amount of light which may enter its interior. Its tissue, besides a pupillary sphincter muscle, and (probably) radial muscular fibres as well, contains blood-vessels running mainly in the direction of the pupil, and is backed by a double layer of pigment which cuts off the light from entering the vitreous through its substance. Somewhat internal to the posterior pole of the globe, the optic nerve passes through a foramen in the sclera and the choroid to break up and be spread out fine in a modified form, as the retina (4) on the internal surface of the uvea. The cavity of the sphere is unequally divided into two, by a diaphragm formed of the lens, slung centrally behind the pupil by numerous bands, the suspensory or zonular ligament, passing tightly from its entire circumference to the anterior ending of the choroid proper; the posterior portion containing the semi-gelatinous vitreous, and the anterior the aqueous humor, which communicate through the open meshes of the ligament.

The uvea, the great vascular membrane of the eye, receives its blood supply from branches of the ophthalmic division of the internal carotid artery which pierce the sclera near the optic nerve, and immediately break up in the choroid, therefore "short" ciliary branches, the "long" ones running forwards between choroid and sclera entire towards the iris before dividing, when they are joined by the anterior continuation of the short vessels, and by "anterior ciliary" vessels which enter the eye in front of the insertion of the recti muscles. From a main circular vessel, thus formed, the iris is supplied by branches converging towards the pupil. The blood from all these is returned by from four to six "vortex veins" formed by the junction in the choroid of the smaller vessels, and piercing the sclera in an opaque direction backward, some thirteen mm. behind the cornea, generally close to, but not under, the straight muscles (A. W. Stirling, 10), except a small quantity carried off by the anterior ciliary veins, which like their corresponding arteries, pass through the sclera not far behind the cornea. The central artery of the retina, entering the eye upon the disc, does not afterwards form any anastomosis among its own branches or with the vessels of the choroid, but with the latter it does form a small anastomosis round the optic nerve close to the eye. The fluids of the interior of the eye are believed to enter at the ciliary body, (perhaps a small quantity enters through the sheath of the optic nerve) to circulate by passing between iris and lens, and leaving at the angle of the anterior chamber, a small proportion only escaping around the central vessels of the optic nerve. The following are grounds for this belief: Besides the difficulty of seeing any other likely source for the fluid, what other sufficiently important uses the highly vascular and convoluted ciliary region could subserve, the suggestive nature of its epithelial covering, and the firm attachment here of the vitreous, numerous experiments have been made which generally add strong support to the idea that this is the great secreting portion of the eye. As well as the recent writings of Treacher Collins, who claims to have found the secreting glands, of Nicati, of Greef, and of John Griffith, who actually saw beads of secretion, there are the older experiments of Deutschmann (11), who, after removal of the ciliary processes and iris in rabbits, found that the vitreous and lens became destroyed, and that the aqueous ceased to be formed; of Schoeler along with Uhthoff (12), who observed that after subcutaneous injections of fluorescin the coloring matter passes from the ciliary body, and perhaps a little from the back of the iris, rapidly into the aqueous and more slowly into the vitreous. Leplat (13) injected potassium iodide subcutaneously, removed the eyes, and testing quantitatively for the salt, confirmed the researches of the others. The manner of its exit is easily understood. Ulrich (14) asserted that it passed through the iris, which on the face of it is unlikely, and is disproved by the fact that when the periphery of the iris adheres all round to the lens capsule the iris is bulged forward by the fluid behind it. That it escapes at the angle of the anterior chamber, and by filtration, was shown by Leber who found diffusible coloring matter passing out by Schlemm's canal and the iritic veins, while colloid material did not do so. The cornea was impermeable even to diffusible bodies, when the layer of epithelium on its posterior surface was in normal condition. Priestley Smith (15) undertook a number of interesting experiments in which he passed fluid into the vitreous and aqueous of newly excised eyes by means of canulae. The result pointed to the following conclusions: (1) that fluid injected into the vitreous chamber escapes chiefly if not entirely through the aqueous chamber; (2) that a slight excess of pressure in the vitreous chamber displaces the lens and iris forwards, compresses the filtration angle and impedes the escape of fluid; (3) that there is no escape through the vortex veins when the filtration angle is compressed; (4) that there is little if any escape at the papilla. Leplat (16) having later, by experiments on living rabbits' eyes, shown that an increase of pressure in the vitreous does not displace the lens forward, Priestley Smith explained the discrepancy between these results and his own by stating that in the living eye it is probable that a rise in pressure in the vitreous is immediately followed by a similar rise in the aqueous. Leplat agreed in finding the escape of fluid in the optic nerve to be very small indeed, though after his earlier experiments with potassium iodide he had concluded that the papilla contained an important channel for this purpose, and others have found reason to support the latter view. Schwalbe's (17) lymph spaces in the optic nerve sheath were believed by him to carry off lymph from retina, vitreous and optic nerve. Gifford (18) injected fluid containing insoluble colored particles into the vitreous, which he saw with the ophthalmoscope, collected at the papilla, and on section the microscope showed the grains passing backward along the lymph spaces *surrounding the central vessels* on their way to the sphenoidal fissure. But though Stilling (19) saw fluid escape from the nerve under pressure, Priestley Smith (20) could find by experiment with colored fluid, neither that it left the eye at the nerve, nor when injected into the sheath could it be made to enter the eye; while Schoeler (21) and Uhthoff saw no sign of fluorescine leaving the eye in that region; nor in previous experiments could Schoeler find that obstruction there lessens the amount of that fluid. Knies (22) has recently supplemented his previous experiments with ferro-cyanide of potassium (23), and holds that the colored diagrams of his results confirm his old contention that the solution passes into the cornea through Descemet's membrane, and justify the assertion, that even in normal circumstances, part of the aqueous leaves the anterior chamber in this way.

In the first stage, the solution injected into the vitreous is found to leave a blue stain, in breadth one-quarter the diameter of the sclera, passing obliquely backwards through the latter to a point behind the equator where it opens into the lymph space of Tenon's capsule. In the second, a colored streak passes forwards, involving the posterior part of the cornea and Descemet's membrane, and this is supposed to prove that it has penetrated from behind and through Descemet's membrane and its endothelium. That appears to be a quite unnecessary assumption, for it is continuous with the scleral streak, and may just as likely pass into the cornea at the angle of the chamber, which in all the diagrams is wide open; and, even if that were closed by albuminous or cellular exudation, the color which had yet been able to penetrâte the sclera might just as well have penetrated the cornea from the same point.

At this stage the color is all at the back of the cornea, not unlikely because it enters from the angle at the back, and because the cornea is composed of stratified laminae. In the next stage, it has occupied the whole cornea, and is making an exit through the sub-conjunctival tissue; while in the last, the posterior part of the cornea is clear, and the color is confined to the anterior layer, and the sub-conjunctival tissue. The solution, whatever be its means of entrance, evidently leaves the cornea by passing gradually forward through its lamellae to the front, and then into the loose tissue under the conjunctiva. A small quantity of fluid, Knies considers, leaves the eye at the optic nerve.

We may reasonably conclude, from all that has been said, that the bulk of the fluid leaves the eye at the angle of the anterior chamber and that probably a little escapes around the central vessels of the optic nerve, but not in the nerve sheath, which more probably transmits it towards the vitreous.

By a consideration of this sketch of what is material in the anatomy and physiology of the eye, one at once observes the close relationship which must exist between abnormalities in the entrances and exits for the ocular fluid and the question of tension. Except under extraordinary circumstances the tissues liable to a change of volume are the fluids, and, by a species of automatic arrangement, these in ordinary conditions can vary little or only for a short time from their normal. Suppose that, by the injection through a needle of a normal saline solution into the vitreous, the intra-ocular pressure be raised, the immediate results will be a diminished inflow by reason of the compressed condition of the uveal vessels, and an increased outflow at the angle of the anterior chamber, till the normal tension has been re-established. Such was Weber's experience, who could not produce glaucoma in this way (24). If, on the other hand, fluid be drawn off from either vitreous or aqueous, the resulting diminution of pressure will produce reduction in the amount leaving the eye, while it will encourage, by permitting dilatation of the arteries, an excessive flow of blood into the interior of the eye with excretion from it at an abnormally rapid rate, till the amount of intra-ocular fluid has reached its average. It is apparent, from what has been said, that the ocular depends materially on the vascular tension.

While all this is apparently simple, the explanation of the origin of increased tension has by no means proved to be so, and our present knowledge of the subject is the result of much labor, observation and discussion. How that has been attained must occupy a very considerable proportion of any study of glaucoma.

It would appear that the increase of the contents of the globe, relative to its size, the cause of high tension, might result from the retention of too much fluid in the eye, from the exit of too little, or from a combination of these; and the endeavor to determine what is the actual state of matters has resulted in much controversy, which is not yet ended. But, as we have seen, there are several varieties of glaucoma, so different in their apparent origin, that we can not expect to find one explanation which will apply equally well in all its details to each. But, whether or not a common principle underlies the etiology of all, will be seen when we come to discuss "simple," "secondary," and other cases, in contra-distinction to typical, senile, acute or sub-acute glaucoma, which we will consider first.

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CHAPTER IV.

ETIOLOGY (Continued).

HYPERSECRETION VERSUS RETENTION.

Before the circulation of the ocular fluid was well understood, and before the means by which its exit may be interrupted had been made clear, a very natural inference fro the hardness of the eye was that there is in Glaucoma excessive secretion. due, as was first thought, to inflammation of the uvea, the inflammatory form being the type of the disease; or, as held by Donders and others after him, the result of abnormal activity of the nerves which govern secretion inside the eye, the "simple" being then the typical form. When Mackenzie (1) noted the relationship between high tension and Glaucoma, he concluded that the disease was due to choroiditis which poured out fluid till the resulting pressure destroyed the soft tissues exposed to it, and he was confirmed in this impression by finding in excised Glaucomatous eyes that the choroid was disorganized. In 1842 Sichel (2) stated that his dissections never showed any alteration in the vitreous, but that he "had always seen Glaucoma succeed a manifest infiltration or at least a congestion, acute or chronic, of the choroid." Arlt (3) observed a choroidal disease in an excised eye affected by secondary Glaucoma. Graefe (4), in 1857, held "acute Glaucoma to be a choroiditis (or irido-choroiditis) with diffuse infiltration of the vitreous (and aqueous), with a rapid rise of tension through increase in the volume of the vitreous. compression of the retina, and the known series of consecutive symptoms:" and. in 1869, he wrote (5) "The beginning of Glaucoma certainly lies in the uvea." . . . "We must admit certain predisposing or coöperating forces, be they in the nerves. vessels or tissues, through which serous choroiditis or irido-choroiditis receives the characteristic stamp of inflammatory Glaucoma." Graefe. not being able to reconcile this with the symptoms of simple Glaucoma. called the latter "Amaurosis with optic nerve excavation." Brailey (6), at one time looked upon Glaucoma as an over secretion from an inflamed iris, ciliary body, and choroid, which resulted rapidly in atrophy of the affected tissues; also, that excess of pigment sometimes in diseased eyes caused high tension. In 1881, having found the *pars ciliaris retinæ* detached from the subjacent pigment layer in ten per cent. of the excised eyes with primary Glaucoma examined by him, but never where the tension was normal or decreased. he (7) asked: "does it indicate that fluid is secreted by the pigment layer more rapidly than it can pass onward into the vitreous chamber?" In a later paper, published the same year, Brailey (8) insisted that inflammation of the uvea is always present before the presence of *plus* tension.

Mauthner's Theory

(9) was that Glaucoma is a choroiditis, complicated, in the anterior segment of the globe, by inflammatory symptoms. which have their origin in different regions of the choroid. and may thus affect the retina at various points. The result is usually a rapid increase of tension, but the disease may progress without this. It is peculiar, not only on account of the *plus* tension, but also because of "an affection of the optic nerve, which is dependent upon the process in the choroid, but is not always present."

Fuchs (10), who is not a supporter of the secretion theory, reported in 1878 that, in 28 out of 57 Glaucomatous eyes, he had seen with the ophthalmoscope atrophic patches in the anterior part of the choroid.

Ulrich

(11) has founded a theory of hypersecretion, with secondary retention due to abnormal impermeability of the iris which also becomes attached to the cornea, and based upon the results of experiments made by him on rabbits, whose cornæ he removed so as to produce complete anterior synechia, as well as upon microscopical examination of pieces of iris removed from human Glaucomatous eyes. Histologically, he found the iris atrophic and sclerosed with obliteration of vessels; the ciliary processes hyperæmic, with pigmentary thrombosis, "leading to disturbance of the circulation of the blood in the iris and ciliary body. . . . Immediately following incarceration of the iris in the corneal scar there was chronic hyperæmia of the ciliary processes, and also hypersecretion of the aqueous, the demonstration of which scarcely required the use of fluorescine."

"This hypersecretion is a fundamental factor in the production of Glaucoma, and accordingly the entire theory is a *secretive theory*, the same that I advanced in 1884, explaining ordinary inflammatory Glaucoma as well as the two principal forms of secondary Glaucoma in man. Impeded permeability of the anterior chamber may be an accessory cause." It is a question whether this should not rather come under the heading of retention theories, in spite of the author's distinct assertion to the contrary, especially when one considers that he speaks elsewhere (12) of "the increase in volume of the vitreous pressing the iris and lens forward and together, and cutting off, more or less, the pupillary route between the anterior and posterior chambers.'' The iris, he says, ''is rubbed against the cornea, becomes hyperæmic and exudes material which binds it to the cornea. This causes the exit by the optic nerve to be more used, which, along with the increased tension, produces cupping. The attack of Glaucoma is brought on by all conditions which interfere with the blood circulation, be they general (heart, etc.,) or special to the eye (Mydriasis).'' Birnbacher (13), considering Ulrich to have asserted that fluid passes into the anterior chamber in normal circumstances through the base of the iris, and expressing his inability to agree with that statement, Ulrich explained that in Glaucoma the pupil is not free on account of the increase in size of the vitreous pushing the lens into closer contact with the iris; and pointed out, in support of the permeability of the iris, that there is fluid in the anterior chamber in total posterior synechia, which could only get there through the iris. To this argument one may reply that Leber said it was an open question whether some of the aqueous was not secreted by the anterior surface of the iris; while we know that the iris is usually bulged forward in such cases; besides which, a little fluid may in certain cases filter through an apparently, but not really, complete posterior synechia, or through an atrophic iris.

The Theory of a Secretion Neurosis

was introduced by Donders (14). He considered inflammatory symptoms to be incidental, and secondary to increased tension. The ciliary branches of the fifth nerve, being irritated, caused a reflex flow of blood with excessive excretion in a manner similar to that which occurs in the glands. The primary irritation was thought to be due especially to senile changes involving the nerves as they passed into the interior of the eye. Magni found the ciliary nerves in Glaucoma to be constantly atrophic. Von Hippel and Gruenhagen (15) by irritation of the fifth nerve, and by extirpation of the superior cervical ganglion, produced hypersecretion of the intra-ocular fluid with raised tension, which they held to support the neurotic theory; and Schmidt-Rimpler (16), in 1875, thought that, among other things, irritative conditions in the region of the trigemini were important in influencing the production of Glaucoma. Schweigger (17) wrote, "The fact that nervous irritation, etc., may occasionally provoke Glaucoma proves that nervous influences may determine periodical attacks of increased tension."

In considering the former of these theories, evidence has already been adduced showing that a mere increase in the amount of fluid in the interior of the eye produces only a very temporary rise of tension. Glaucoma is not by any means a usual feature of uveal inflammation, and when it does occur it is generally different from common Glaucoma, and due to another explicable cause. And Glaucoma is common without any sign of such inflammation. It is true that in old glaucomatous eyes, patches of inflammation are frequently met with in the choroid and in the ciliary region, but there is reason to believe these to be among the many secondary changes resulting from long continued excessive pressure, or merely accidently associated with Glaucoma. At the same time it is not unlikely that, in uveæ which are already diseased, the congestive or other disordered states, which may start the cycle of events which constitute Glaucoma, may be more easily set in motion.

In connection with the theory of a secretion neurosis, little favorable evidence of value has been advanced. Hermann Schmidt (18) expressed a belief that severe toothache produced increased intra-ocular tension; but Priestley Smith (19), showed by the examination of patients in a dental hospital that this view was erroneous. Pain in the fifth nerve, as in any other nerve, might start Glaucoma; but probably, neither directly nor reflexly, but rather by inducing exhaustion and sleeplessnes, and its common occurrence in Glaucoma can best be explained as a secondary result of the pressure on the nerves within the eye, which is supported by the fact that relief generally immediately appears on reduction of the tension. Weber (20) endeavored unsuccessfully to produce Glaucoma by dividing nerves, tying them, passing threads, glass, etc., into the eye, as well as by paralyzing the sympathetic, and irritating the fifth nerve.

Retention Theories.

The discovery of certain pathological changes in the outlets of the now better understood circulatory system for the intra-ocular fluid, along with the apparent insufficiency of the hypersecretion theories, brought into great and

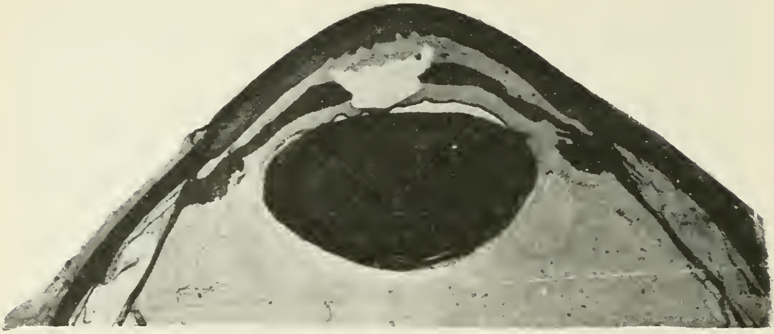

Fig. 3 shows the angle of the anterior chamber, the relationships of the cornea, iris, ciliary body, Schlemm's canal, and lens in a normal eye.

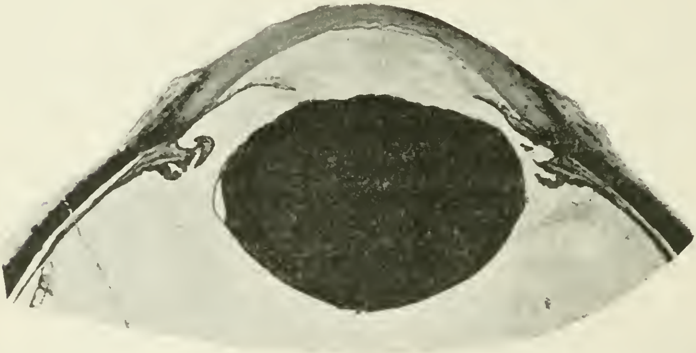

Fig. 4. Primary absolute glaucoma, without operation. The lens was cataractous, and there was cystic degeneration of the iris. This section should be compared with that of the normal eye.

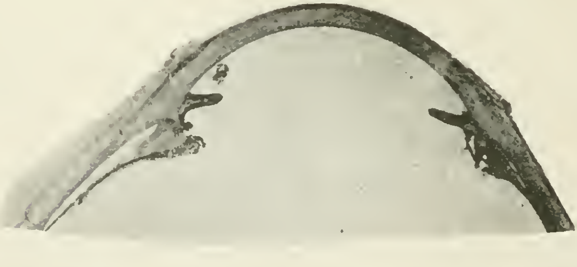

Fig. 5. Glaucoma of long standing, with peripheral anterior synechia, shrinking of iris, ectropion of uveal prigment, and anterior displacement of the sphincter of the iris.

enduring prominence the idea that it is not so much an increased inflow as an obstructed outflow which lies at the bottom of raised tension with all its consequences. Knies and Weber were not the first to notice these changes, but nearly simultaneously they first observed their importance, and brought it before the profession, though not with the same explanation. It has been pointed out by H. Snellen that, though H. Mueller is generally credited with first noticing this condition in 1858, Donders (22) mentioned in 1855 "the diminution of the anterior chamber through adhesion of the periphery of the anterior surface of the iris with the posterior surface of Descemet's membrane, simply as a consequence of increased pressure through exudation processes in the hind part of the eye." Mueller (23) said, in 1858 "The iris adheres with its ciliary border to the periphery of the cornea, whilst it separates very easily from the ciliary body;" and, "the iris adheres with its periphery more closely to the sclera than to the ciliary body, as frequently happens in such cases." Schmidt-Rimpler (24), in 1875, mentioned having observed the peripheral zone of the iris pressed hard against the cornea, but in a summary does not include this among the important points in connection with Glaucoma, except in saying that there are possibilities of interference in the outflow of lymph. In 1876, Pagenstecher (25) reported eight eyes, in two of which he had observed that the iris and cornea were in contact. Knies (26) soon afterward wrote an account of fifteen excised glaucomatous eyes, which showed, besides infiltration of various tissues, peripheral anterior synechiæ, and Weber (20), a little later, followed with an account of certain experiments on rabbits, and with four cases in which the same position of the iris was present. Closely behind Weber's paper, came another from Knies (27) reporting six more cases of the same kind, after which the adhesion appears to have become a well recognized condition in glaucoma, and pathologists soon began rather to record cases in which it was absent. The meaning of it has excited much controversy, which has greatly aided the development of a true understanding of the glaucoma process.

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CHAPTER V.

ETIOLOGY (Continued).

THE THEORIES OF WEBER AND KNIES.

Weber's Theory.

Weber (1A) endeavored to produce Glaucoma by artificially exciting a serous choroiditis (Graefe's theory), or through division and irritation of nerves (Donder's theory), but with as little success as he attained by injections into the vitreous. He therefore concluded that the disease had a mechanical causation. He then tried to shut off the exits for the intra-ocular fluid, first by injecting quicksilver into the anterior chamber of rabbits; but this simply destroyed the eyes. He then used oil, which in one case produced a Glaucoma-like affection with iritis, anterior adhesion of the iris, and enlargement of the cornea, but without cupping, because the optic nerve of rabbits enters the eye at an angle of 45 degrees. Weber also specially reported four cases in human eyes. These included a secondary and a simple, as well as congestive cases, and, in the congestive and secondary cases, the iris adhered to the cornea, and the ciliary processes were either enlarged or atrophic. He concluded that "In all cases of Glaucoma, inflammatory and non-inflammatory, primary and secondary, the filtration passages are narrowed and finally closed," the result of *swelling of the ciliary processes* which come to press upon the iris behind till the latter touches the ligamentum pectinatum and back of the cornea, and cuts off from the angle the fluid in the anterior chamber.

Knies's Theory.

In the cases already referred to which Knies reported in 1876 the points which he specially noted were cellular infiltration of iris, cornea, and choroid, with closure of the angle, and cupping of the optic disc. In 1890 he (1) entered fully into the subject, explaining the connection which appeared to exist between these conditions and the onset of Glaucoma. He separated simple Glaucoma altogether and said it was another disease. He advanced the theory that in congestive Glaucoma there exists an *irritant poison within the ocular vessels alone*, and that this, having passed within the tissues of the eye, sets up an inflammation in the channels at which it has its exit. He defined Glaucoma as a distinct and peculiar disease "which begins with cell infiltration of the corneo-scleral border, the neighboring tissue, and with inflammatory symptoms of the optic nerve, going on to adhesion of the periphery of the iris with the cornea, and obliteration of the spaces of Fontana, and if not treated it leads to blinding with characteristic cupping of the optic nerve." He considers the infiltration of tissue round Schlemm's canal to be present before *plus* tension; and, though in many cases the iris is then normal, there are others, especially very acute cases, in which an exudation of white and red blood corpuscles and pigment are found on the anterior surface, sufficient visibly to produce adhesion between iris and cornea. The ciliary bodies he found also infiltrated before the advent of high tension, which is true to a less degree of the ciliary processes. When a case is going to be acute there are very often signs of iritis and cyclitis; when less acute these are wanting, or found only in the angle or ciliary muscle." "One receives the impression that finally the *whole neighborhood of Schlemm's canal* was after this cicatricially drawn in, whereby the iris periphery was made. through shortening and retraction of the fibres of the ligamentum pectinatum (Brailey) to lie on the cornea and finally to adhere to it. The point of adhesion and cicatrisation shows objectively no longer any sign of cell filtration," though not infrequently some round cells are scattered about. The initial inflammation of the ciliary body soon gives way to atrophy, the circular muscular fibres in this condition turn forward at an acute angle toward the lens (Weber); sclerosis ensues (Brailey); and frequently after the commencement of *plus* tension (or as its cause, according to Brailey. and so before *plus* tension) dilatation of the arteries and thinning of their walls are found. The early congestion with little cellulary infiltration existing in the ciliary processes results also, but to a less extent, in atrophy. The processes lie close to the iris, but do not touch it, therefore "Weber finds himself compelled to say that his preparations were much more convincing when fresh." Weber's explanation is not generally applicable, and in typical cyclitis where the ciliary processes are much swollen, the results are not similar to ordinary Glaucoma, and the anterior chamber is deep. (See serous iritis.)

When Fontana's spaces are only partially blocked increase of tension may be very slight, but when the blockade is combined with hypersecretion the eye is bound to become harder. The cells about Fontana's space may press the fibres asunder. and on disappearing leave holes through which the fluid may escape, the tension become normal or *minus* while the angle is still blocked. Heightened tension, he said. is not synonymous with Glaucoma, but is only a symptom.

When this theory is compared with that of Weber, some noteworthy differences will be observed. Both have proved to be of great service in ocular pathology, not only on account of the main point upon which they agree, the sealing up of the filtration angle, but also because of the stimulus they gave to farther investigation and discussion, which requires to be considered here.

Brailey (2) found in 53 Glaucomatous eyes the corneoiritic adhesion to be generally present, and he admitted the angle of the anterior chamber, uncovered externally by conjunctiva, as normally a likely place for the escape of fluid, and that its closure by impervious iris might without doubt be a factor in keeping up increased tension, while it could not, he thought. be its main cause, for the adhesion is found without *plus* tension, and *plus* tension is found withwithout adhesion. While not denying that apposition between iris and cornea might be primary, Brailey held that it was probably secondary to some mechanical pressure, evidenced by one of his cases where there was near contact and no adhesion, and this, he considered, emanates from behind the plane of the lens, in the form of an increased flow "issuing somewhere between the ciliary muscle and the periphery of the lens," but he did "not think that the advance of the lens will account for it." The adhesion between the iris and cornea, like that between the external and internal surfaces of Schlemm's canal, and like the increase of nuclei in that neighborhad, is merely the result of compression. In his next contribution (3) in 1879 he reported on the pathological anatomy of 149 eyes, some of them considered in the last, but all of them having had their tension accurately recorded at the time of excision. Of these, either the angle of the anterior chamber or Schlemm's canal was closed in some part in all but 8 of the 86 which had *plus* tension, 9 had the angle free above and below; of the 21 which had tension normal 14 had the angle free above and below; of the 34 which had minus tension, 18 had the angle free above and below. Schlemm's canal was either quite closed in some part of its circumference, or barely visible, in 111 of the 149 eyes. Signs of inflammation were generally seen where the iris was applied to the cornea chiefly on the anterior surface of the iris and between it and the cornea. In the next paper in 1881 (16) Brailey asserted that the increase of tension follows an inflammation of the ciliary body, iris, and optic nerve, but chiefly of the ciliary body, the enlargement of whose folds "due to their vascular turgescence" is indeed the initial cause of the application of the iris to the cornea, which is nearly always present, and which is continued by pressure arising behind. This may be taken as so far supporting Weber's theory.

In 1877, Wecker (4) denied the inflammatory character of the congestive symptoms of Glaucoma, and in 1879 he says (5), "It is now two years since I published in the Archives of Ophthalmology this sentence, 'According to Donders the excess of tension in Glaucoma is the result of *hypersecretion*; from my point of view it results in the majority of cases from some check in excretion.' 'The only difference between Weber and myself is that he uses the word filtration while I use excretion.' . . . . . 'In the work quoted above I have alluded to the fact that the channels of filtration discovered by Leber become narrowed by hyaline or epithelial masses,' and 'I was the first to adopt the idea that Glucoma resulted from impaired filtration.' . . . . 'I have always taught that at the optic nerve and angle of the anterior chamber alone the eye is without a hyaloid amorphous membrane, quite unfit for filtration.''

Pagenstecher reported at the Ophthalmological Congress in 1877, six attempts to produce Glaucoma in rabbits' eyes by the injection of oil into the anterior chamber, with one success in the production of increased tension, and none in the production of cupping. He also reported cases with *plus* tension and a free angle. and others with minus tension and a closed angel.

Schnabel (6) in 1878 examined thirteen eyes enucleated for Glaucoma, and found the cornea and iris merely in apposition in one case, adherent in ten cases, and not even in apposition in two which were cases of glaucoma simplex. The longer the *plus* tension, the more firm he found the adhesions, and the iris was always thin at the adhering parts. Schlemm's canal was generally normal and empty, but sometimes narrow or invisible. ''I have never seen a connecting substance which could have been supposed to be produced by the agglutinated walls of the chamber or to have preceded or caused the adhesion,'' and he believes that there is no iritis in common Glaucoma. Schnabel considered as antagonistic to the Knies-Weber theory the fact that he had seen eyes lost by uveitis possessing an angle closed by the contact of iris and cornea, 'appearing in undoubted inflammation and persisting in soft eyes;'' and eyes recovered after iridectomy where the iris still remained peripherally attached to the cornea, ''inflammation does not precede the adhesion at the angle, as Knies says but follows it.'' ''The apposition of the iris and cornea of some duration is the essential cause for the obliteration of the angle of the anterior chamber.'' . . ''The attachment of the iris to the ligamentum pectinatum is caused by a disease of the endothelial lining of these tissues, but I cannot decide whether this disease is only the consequence of abnormal contact or whether, as in kerato-iritis it is one of the effects of this process.'' . . . . ''It is certain that it is not produced only by the infiltration of the two surfaces." . . . . "The obliteration of the angle of the anterior chamber alone is harmless; the traction of the origin of the iris, and the stretching of the sclerocorneal margin cause the increase of tension." Schnabel also asserts that the ciliary processes are not necessarily swollen, as shown by a case of his where they had previously atrophied.

Schoeler (7) in 1879 produced *plus* tension and cupping in rabbits by cauterising the corneo-scleral margin. Birnbacker and Czermak (8) considered the adhesion at the angel as a part of the general inflammation of various grades in the uveal tract, and not a mere symptom of pressure; and again Birnbacher (17) described a case which caused him to relinquish the idea of a primary inflammation of the angle.

Schweigger (18) was disinclined to adopt a retention theory, and argued that slight passing attacks controverted it. "In what way does the filtration angle become so quickly blocked up, and so suddenly restored?" If this, or as he calls it, Leber's theory, were true, every narrow angle or anterior synechia would produce Glaucoma. "Reindorf (9) thought that a shallow anterior chamber is unfavorable to the views of Knies, for with the initial blockade at the angle the iris should be pushed back from the cornea.

It will be necessary later to consider a modification of the Knies and Weber theory, first published in 1879, and later built up by prolonged and careful investigations, by Priestley Smith; but in the meantime it will suffice to state that in some 80 glaucomatous eyes examined by himself he always found the angle closed by apposition of iris and cornea, except in three or four cases in which there was special reason for the absence of this feature. To quote, (10) from his book, "The ciliary processes are usually altered, both in size and position. If the glaucoma have been of recent date and congestive type, they are enlarged, their apices extending forward far beyond the customary limit. In such cases they are usually in close contact with the iris anteriorily, and sometimes with the margin of the lens internally; or, if no longer in contact, their wedge-like shape shows that in the living eye they have been tightly pressed between these structures. Viewing them in transverse section we see that they are increased in thickness also, the spaces between the processes being narrowed, or even obliterated by the swelling of the lateral convolutions. If, on the other hand, the Glaucoma have been of long standing the processes are sometimes much shrunken ard retracted, being then far removed from the base of the iris; but even in such cases the iris base often bears the impress of the former contact. Between extreme hypertrophy, on the one hand, and extreme atrophy, on the other, any degree of swelling or shrinking may be present. The ciliary muscle participates in these changes. At first it is drawn forward with the processes: later it retracts and atrophies." . . . . "Sometimes the iris base adheres to the processes, and is drawn backward when they retract, so that its adhesion with the cornea is more or less torn through: or, if not torn through, the iris base may be stretched in the direction of its thickness, and present a peculiar bend or notch in its anterior surface just at the limit of the adhesion."

Ulrich (12) said that Knies did not explain the origin of the irritating material which he supposes to give rise to the inflammation which originates the corneo-iritic adhesion: and as uveal pigment is evidently carried into the angle, why should not the cells found there have the same distant origin? "It has long been known that in fresh cases of Glaucoma the so-called corneo-iritic adhesion is only a simple apposition, and not a true adhesion." Anatomical conditions and laws of physics render it untenable that the anterior chamber should be shallow were the angular adhesion primary, but it is quite otherwise when the retention is behind the iris.

Galezowski (13) in 1894 had "almost always, if not always, found changes of the canal of Schlemm, of the lymph channels in the sclera, of the choroid, and of the optic nerve itself, whence arises the conviction that in the obliteration, partial or total, of the canal of Schlemm, resides the principal cause of Glaucomatous affections." He quoted two cases of Glaucoma, secondary to dislocation of the lens, which seemed to show that the high tension was produced by the lens pressing forward against the iris, the tension diminishing on the head being thrown back.

Bitzos (14) wrote, "It is necessary to reject all theories explaining Glaucoma by localizing the lesion in the sclera, choroid or zonule, for several reasons: above all because they do not explain the propulsion of the iris. One is thus compelled to find the cause behind the lento-zonular diaphragm."

Knies (15) has recently recorded a series of experiments on the eyes of dogs with the avowed object of demonstrating "the passages of outflow from the vitreous and aqueous by means of the changes which substances capable of provoking irritation and inflammation excite in their passage through the walls of the eye-ball." It is apparent from this paper that its author still holds that the adhesions at the angle of the anterior chamber are due to, irritation set up by what might be termed a specific Glaucoma poison, as it passes out of the eye, and he endeavors to reconcile all the results of his experiments with this idea; but, as the unprejudiced observer must admit, with indifferent success. He first, as he did before, overcomes the difficulties which confront him in connection with simple Glaucoma by putting it entirely out of court, on the very doubtful ground that it is not Glaucoma at all; and then, confining himself to inflammatory cases, calls the disease "Irido-cyclitis in which the anterior channels of outflow of the eye are occluded, temporarily at first, afterward permanently." This is to be distinguished from ordinary Irido-cyclitis "by the fact that in the latter the nocuous element has from the outset its seat in the iris and ciliary processes, while in the former it circulates in the vitreous and aqueous, and in its exit from the eye causes an inflammation of the iris and ciliary body starting from the region of the angle of the anterior chamber. It must be admitted that in the genuine Glaucomas we can make no definite statements in regard to the nature of this element; while in the secondary Glaucomas, *i. e.* in those for which we know an exciting cause, whether it be a malignant tumor, a luxated lens or retinal haemorrhages, we must assume an existence of such an element circulating in the vitreous." But no such hypothesis is really required, for Glaucoma in all these and other conditions, has been explained in a manner which is simpler, more evident, more inclusive, and which does not necessitate the designation of the quieter forms by another name.

Knies introduced into the vitreous (a) olive oil, (b) dilute oil of turpentine, (c) strong oil of turpentine, and (d) a mixture of unguentum hydrargyri cinereum, olive oil, and oil of turpentine. In every case in which dilute oil of turpentine was used an attack of Glaucoma set in about six hours later, and Knies claims this as the first series of experiments in which Glaucoma has been artificially produced. (See Weber, p.72, and Pagenstecher, p. 71.) The attacks, which were all transitory, were characterized by the usual signs: marked increase of tension, mydriasis, and sometimes slight vapor-like opacity of the center of the cornea." That the Glaucoma was transient is explained on the hypothesis that an albuminous excretion, apparent, though slight, coagulation in the vitreous and aqueous blocked up the channels of excretion, and afterward contracted so as to permit of the passage of the aqueous. Knies does not say that the anterior chamber was shallow, nor does he explain how a mere blockade of the channel of exit, even with a subsequent local inflammation, could produce such a condition, which on the face of it appears to be impossible; while, if the anterior chamber was deep, the *plus* tension might also have been due to the filling of the angle with the injected oil.

The strong oil of turpentine proved too irritating and was abandoned, and the simple olive oil turned out to be infectious and had disastrous results of no value in this connection. The "oleum cinereum" acted in a much more active manner than the dilute oil of turpentine, and produced inflammatory reaction, what Knies called "Glaucoma imminens" without increased tension (in fact not Glaucoma at all), "since the action of the liquids used by me was obviously different in a qualitative way from that of the products of tissue metamorphosis that are the efficient agents in human Glaucoma." . . . "Obviously, in order to insure the development of a fully fledged Glaucoma, the inflammatory agent *must act continuously, but less intensely* than the material that I used, *i. e.* must probably act like a substance secreted by a growing malignant tumor."

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(To be continued.)

TWO CASES OF VERNAL CATARRH IN WHICH THE ROLLER FORCEPS WERE EMPLOYED WITH GOOD EFFECT.

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The treatment of vernal catarrh, and especially of that variety in which the palpebral conjunctiva is involved, is usually so very unsatisfactory that one need not hesitate to report even a single case in which a departure from routine therapeutic measures has yielded comparatively favorable results.

In Maryland, as, I believe, in other sections of the United States, vernal catarrh is a rare affection, nevertheless I have from time to time met with a considerable number of these cases, usually in hospital practice, but occasionally among my private patients. The two different types of this disease, that in which the peri-corneal conjunctiva is the seat of hypertrophic changes, and that in which the palpebral conjunctiva is involved. have, I think, been about equally represented; and I may add that I cannot recall a single instance in which I have met with both types co-existing in the same individual—an experience which, I imagine, is somewhat unusual. My cases have been nearly equally divided between the sexes and, in accordance with the rule, have almost always been encountered in young persons. In one instance the typical palpebral variety of the disease was met with in a father and son, and in another the same type of the affection occurred in two sisters. A sufficiently large proportion of my cases to make the fact seem worthy of remark have occurred in children of German parentage.

As to treatment, I have, in the peri-corneal variety of the disease, derived some benefit from atropia and yellow oxide of mercury ointment combined with the internal administration of the iodide of iron. A collyrium of sulphate of zinc and boracic acid has also, at times, appeared to be of use. In the palpebral variety, in which the papillæ of the conjunctiva of the upper lid (I have never met with this same condition in the lower lid) become so greatly hypertrophied and subsequently flattened, I have, heretofore, obtained only the most meagre results from the various therapeutic measures which I have employed. In two cases of this character, however, which have recently come under my care I have employed Knapp's roller forceps as they are used in trachoma, and as in one of these the result has been most gratifying and in the other, a chronic and unusually severe case, undoubted benefit has followed. I have thought it worthwhile to report them briefly.

CASE 1. Miss X, about 16 years of age, the daughter of a physician of German birth practicing in Baltimore, consulted me, in Nov. 1895, in reference to a recent inflammation of the left eye. Some conjunctival injection, accompanied by considerable swelling of the upper lid, was observed. On the left side of the neck there was an enlarged lymphatic gland, which subsequently suppurated. Upon eversion of the upper lid a marked palpebral conjunctivis was discovered, which led me at first to suppose that I had to do either with an unusually severe follicular conjunctivitis or a commencing trachoma. At this visit a collyrium of alum and boracic acid was prescribed and the patient was put upon the iodide of iron. Subsequently mercurial ointment was ordered to be rubbed upon the outer surface of the swollen upper lid.

Under this treatment little change for the better took place, and it soon became evident, as the characteristic hypertrophic changes in the pupillæ of the palpebral conjunctiva developed, that I had to deal with a case of vernal catarrh. Acting upon the suggestion of Van Milligen, of Constantinople, who has had a large experience in the treatment of this affection, I now substituted for the alum and boracic acid a collyrium of acetic acid: acid acetic dil. gtt. ii. to aq-destil. ℥i.., still continuing the inunctions of mercurial ointment to tge lid.

Not to prolong unduly the history of the case, I may state briefly that, after this treatment had been kept up for two months without appreciable improvement manifesting itself, I decided to use the roller forceps of Knapp. It was only necessary to use them once, for a rapid and marked change for the better was almost immedialsly observed. The forceps were used on March 11th, 1896. Two days later my notes state "lid looking very much smoother." April 25th the note reads "eye much better," and on June 20th "very much better. Lid nearly free from 'granulations.'" Sept. 5th "Eye about well. The upper retro-tarsal fold seems normal, and there is only a trace of 'roughness' at two points on inner surface of lid, over cartilage." The acetic acid collyrium, which had been continued, was now directed to be used only twice a day and the application of the mercurial ointment was stopped. In April the opposite eye for a short time showed some hyperæmia of the conjunctiva and lachrymation, but these soon disappeared, and there has been no further trouble with it.

The patient was seen last a few days since (Dec. 12th). Although she had neglected to use the drops for some time, the eye was feeling and looking well. At only one point on the palpebral conjunctiva, over the cartilage, there was a mere trace of the former "roughness." I may add that the hypertrophied papillæ in this case were not tough and flattened, as we find them in cases of longer standing, and as they were in the one which follows.

Case II. D. S., aged 9, was first seen at the dispensary of the Johns Hopkins Hospital, Jan. 25th, 1896. He presented one of the most typical cases of vernal catarrh of the palpebral conjunctiva I have ever met with. Both eyes were affected, the inflammatory changes in each being confined to the conjunctiva of the upper lid. His father, a Hebrew, of German birth, who accompanied him, and who, himself, showed unmistakable traces of a declining disease of the same type, which he had suffered with for many years, stated that his son had had trouble with his eyes from birth—a statement which was not thought to be strictly accurate—and that he had received treatment at various institutions. The conjunctival surface of each upper lid presented the typical "tessellated" appearance, the greatly hypertrophied follicles being flattened and very tough. The ocular conjunctivæ were somewhat hyperæmic, but showed no other evidence of disease.

A collyrium of acetic acid (of the strength mentioned in case I.) was prescribed, and was used for two months without producing any appreciable change for the better. April 4th the roller forceps were used upon the left eye. A slight improvement followed, and on May 5th both eyes were similarly dealt with. During the summer I lost sight of the case, but in the autumn once more took charge of it, and, on Sept. 30th, used the forceps again on each eye. An unmistakable change for the better resulted—a diminution in the size of the hypertrophied follicles and, probably, a decrease in their number. Encouraged by this result, I repeated the operation on Oct. 27th and found within a week a more decided improvement than had been observed after any previous use of the forceps.

The case is still under observation, and it cannot as yet, by any means, be claimed that it is "out of the woods;" but, I think, in view of its very chronic character, the change for the better which has already taken place is encouraging, and warrants the belief that a cure will be effected at no very distant day. The use of the roller forceps, I anticipate, will have to be repeated, perhaps several times, before a complete absorption of the hypertrophied follicle is brought about. The acetic acid collyrium, I should add, has been continued up to the present time.

A NEW CLASSIFICATION OF THE MOTOR ANOMALIES OF THE EYE, BASED UPON PHYSIOLOGICAL PRINCIPLES.

THE PRIZE ESSAY OF THE ALUMNI ASSOCIATION OF THE COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK, FOR 1896.

By Alexander Duane, M. D.,

NEW YORK.

Part 2. Pathology.

IV.. Classification of Ocular Deviations. Nature of functions that may be affected.—Nature of lesions affecting these functions.—Hypokinesis. Hyperkinesis. Parakinesis.—Variation in degree of the lesions. Superable and insuperable deviations (Heterophoria and Squint).—Classification propounded.—Comitant and non-comitant deviations.—General diagnostic laws based upon the presence or absence of comitancy.—Transformation of non-comitant into comitant deviations.

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VI. Anomalies of Associated Parallel Movements. Hypokinsis. Paresis and insufficiency of associated parallel movements. Spasm of associated parallel movements. Peculiar case of spasm observed by the author.—Parakinesis of associated movements (Nystagmus). Theory of nystagmus.

VII. Anomalies of Convergence. Hypokinesis. Paralysis of convergence.—Convergence-insufficiency. Signs. Nature and etiology. Varieties of non-accommodative convergence-insufficiency. Accommodative convergence-insufficiency; varieties. Course. Complications. Symptoms. Treatment.—Hyperkinesis. Spasm of convergence. Convergence-excess. Signs. Etiology. Varieties of non-accommodative and of accommodative convergence-excess. Course. Complications. Symptoms. Treatment.

IV.

THE CLASSIFICATION OF OCULAR DEVIATIONS.

We have seen in Section II. of this brochure that as physiologists we have to consider not only the movements of the individual muscles and the relative power of the latter, but also, and more particularly, the associated movements of the eyes produced by the coördinated actions of these muscles. It seems obvious that the same principles which we apply to the physiology of the ocular movements should also be applied to their pathology, and that in classifying motor disorders of the eye we should concern ourselves *not simply with the disorders and weaknesses of the muscles as such, but also with the affections of all the various movements of which either eye alone or both eyes together are susceptible.* Reasoning in this way, we shall ask if we do not in actual practice meet with pathological conditions which may be classified into the following groups, corresponding to the physiological groups which we have already studied?

(1) Disorders of individual muscles.
(2) Disorders of associated parallel movements.
(3) Disorders of convergence.
(4) Disorders of divergence.
(5) Disorders of sursumvergence.
(6) Disorders of the rotation (or swivel) movements.

I think that we have a sufficient number of clinical facts to enable us to give an affirmative answer to this query.

For example, we meet with quite a number of cases in which the power of convergence is weak—a state that we might attribute (as indeed it often is attributed) to an intrinsic weakness of the interni, were it not for the fact that the working of the latter in associated parallel movements is quite normal. Here then, evidently, it is the function of convergence that is at fault and not the action of the interni per se. Similarly we find excessive divergence action which can not be attributed to weakness of the interni, since the latter act normally both in convergence and in lateral movements, nor yet to excessive strength of the externi as such, since the latter in associated parallel movements do not carry the eye too far outward. In this case, therefore, it is the function of divergence, and not the power of the interni, or externi, that is at fault. Both this condition and the preceding one exhibit the common symptom of divergence in fixation and would hence ordinarily be classed together as examples of exophoria; but in classifying them thus we should be naming not the disease but the symptom. The symptom, moreover, while the most obvious, is not necessarily the most important feature of the condition in question; and in our therapeusis we aim not so much to abrogate the exophoria per se, as to remove the state (defective convergence, excessive divergence) causing the exophoria.

Similar instances might be given of other varieties of motor disorders in which also *the function involved is an ocular movement and not an ocular muscle.* The consideration of these, however, will be deferred until later when they can be discussed more in detail; those given above being regarded as sufficient for purposes of illustration.

If, then, any one of the ocular motor functions may be involved independently of the rest, we must next inquire what may be **the nature of the lesion** affecting it. In answer to this it may be said that any motor function may be deranged in either one of three ways.

(1) It may be performed inadequately or not at all—deficiency of movement *(Hypokinesis)*.

(2) It may be performed excessively—excessive movement *(Hyperkinesis)*.

(3) It may be performed irregularly or in successive phases of excess and inadequacy—irregular movement *(Parakinesis)*.

To the question whether disorders having these various characters are actually encountered in connection with the ocular movements, clinical facts once more enable us to give an affirmative answer. It must, however, be understood that these conditions, namely hypokinesis, hyperkinesis and parakinesis, may be present in very varying *degrees*. Thus weakness (hypokinesis) may vary all the way from a slight and transient enfeeblement to a complete paralysis; and, similarly, excessive action (hyperkinesis) may range from a moderate degree of over-action to an intense and permanent spasm. It thus happens that there are some deviations so slight as to be habitually corrected by the supplementary effort that the patient is able to exert *(Superable deviation, Latent strabismus, Heterophoria)*; while there are other deviations so great that the patient can overcome them with difficulty if at all, and which are hence more or less constantly present (*Insuperable deviation*, *Manifest squint*, *Heterotropia*). These latter again are divided according to the constancy of their occurrence into *Intermittent*, when present at intervals, *Periodic*, when recurring regularly under certain conditions (*e. g.* in convergence), and *Constant*. It should be borne in mind, however, that these distinctions all represent differences simply of degree and not of kind.

The foregoing considerations, confirmed and modified by the results of the examination of quite a large amount of clinical material, have led me to propound the following **classification of the motor anomalies of the eye.**

CLASSIFICATION OF THE MOTOR ANOMALIES OF THE EYE. OCULAR DEVIATIONS IN GENERAL DUE TO

I. Anomalies of Individual Muscles or of their Nerve-nuclei.
(*a*) *Under-action.* The muscle works inefficiently.
1. Because the muscle itself is ill-developed or atrophied (Structural Squint), or because its attachments are unfavorable for effective action (Insertional Squint).
2. Because of impairment of the nerve or nerve-nucleus supplying the muscle (Paretic Squint).
(*b*.) *Over-action.* The muscle works excessively.
1. Because the muscle itself is over-developed (Structural Squint), or because its attachments are favorable for effective action (Insertional Squint).
2. Because of over-excitation of the nerve or nerve-nucleus supplying the muscle (Spastic Squint).
(*c*.) *Perverted action.* Clonic spasm of individual muscles (some rare forms of Nystagmus).
II. Anomalies of the Association Centres for Parallel Movements.
(*a*.) *Under-action.* Producing an equal impairment in the movement of both eyes either (1) up, (2) down, (3) to the right, (4) to the left, or (5) obliquely, or (6) an equal impairment of the rotary (swivel) movements of the two eyes. (Associated Paralysis, Conjugate Paralytic Deviation.)
(*b*.) *Over-action.* Producing an equal excessive movement of both eyes in the same direction (Associated Spasm, Conjugate Spastic Deviation).
(*c*.) *Perverted action.* Clonic Spasm (Ordinary Nystagmus: including Lateral, Vertical, Rotary and Mixed Nystagmus).
III. Anomalies of the Centre for Convergence-Movements.
(*a*.) *Under-action.* Convergence-Insufficiency (producing one variety of Comitant Divergent Squint or Exophoria).
1. Accommodative (due to relaxed accommodation in myopes).
2. Non-accommodative.
(*b*.) *Over-action.* Convergence-Excess (producing one form of Comitant Divergent Strabismus or Esophoria).
1. Accommodative (due to excess of accommodation in hypermetropes.)

2. Non-accommodative.

IV. Anomalies of the Centre for Divergence Movements.
  (*a.*) *Under-action.* Divergence-Insufficiency (producing one form of Comitant Convergent Squint or Esophoria).
  (*b.*) *Over-action.* Divergence excess (producing one form of Comitant Divergent Squint or Exophoria).

V. Anomalies of Sursumvergence.
  (*a.*) *Under-action.* Sursumvergence-Insufficiency.
  (*b.*) *Over-action.* Sursumvergence-Excess (producing constant or intermittent vertical divergence of the visual lines; including cases in which one visual line is habitually above (Spastic Right or Left Hyperphoria), and cases in which sometimes one, sometimes the other, rises higher (Alternating Hyperphoria).

VI. Anomalies of Rotation (Swivel or Torsion) Movements.
  (*a.*) Habitual or intermittent divergence of the Vertical meridians (Cyclophoria-Divergens).
  (*b.*) Convergence of the vertical meridians (Cyclophoria Convergens).

VII. Mixed Forms. Many varieties including particularly—
  (*a.*) Convergence-Insufficiency combined with Divergence-Excess.
  (*b.*) Convergence-Insufficiency combined with Divergence-Insufficiency.
  (*c.*) Convergence-Insufficiency, simple or complicated, combined with under-action or over-action of one or more of the lateral or vertical muscles.
  (*d.*) Convergence-Excess combined with Divergence-Insufficiency.
  (*e.*) Convergence-Excess combined with Divergence-Excess.
  (*f.*) Convergence-Excess, simple or complicated, combined with under-action or over-action of one or more of the lateral or vertical muscles.
  (*g.*) Under-action of one muscle combined with over-action of another.

Before taking up the study of the individual anomalies, it is well to consider one or two features common to all of them.

Comitant* and Non-comitant Deviations. A wide difference exists both as regards symptoms and physical signs between motor disorders in which the amount of deviation constantly changes according to the direction of the gaze (*Non-comitant deviations*) and those in which it remains the same (*Comitant deviations*). The former is apt to be much the more troublesome of the two to the patient, particularly when the deviation keeps changing while the eyes are executing associated parallel movements. This is apparently due to the fact that the symptoms occasioned by the deviation, changing as they do with every alteration in the position of the eyes, cannot be allowed for nor be as readily ignored as when they are constant.

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*The word "comitant" is here employed in preference to the more usual "concomitant" as being both briefer and etymologically better.

That is, since the patient sometimes sees single, sometimes double, *i. e.* is affected with an error of varying amount, he cannot as readily make allowances for his peculiar state of vision as if he saw double all the time and had a constant error to contend with. Moreover, it is less easy for the eye to suppress a false image when the latter, instead of occupying always the same spot upon the retina, as it does in comitant deviations, occupies a number of different spots in succession, as it does in the case of a non-comitant deviation. Hence the diplopia tends to persist much longer in non-comitant disorders than in those that are comitant. Besides, the very fact that the deflection is changeable in amount is the cause of the most trying symptoms (false projection and vertigo) of a non-comitant deviation; and when the deflection becomes constant in quantity for all directions of the gaze, these symptoms are apt to disappear.

It is obvious that *an affection of the individual ocular muscles*, whether in the direction of excess or of deficiency, must cause a non-comitant deviation, the angle between the two visual lines becoming greater and greater the more the eyes are carried in the direction in which the muscles in question normally exert their greatest influence. Thus in a paralysis of the right externus the right eye will lag more and more behind its fellow in proportion as the eyes are carried to the right; and in paralysis of the right superior rectus the right eye will fall more and more below the level of the other, the more the attempt is made to direct the gaze up and to the right. In fact, it is by this very changeableness or non-comitancy of the deviation that we make our diagnosis of the existence of muscular paralysis or spasm.

On the other hand, a deviation due simply to an over-action or under-action of either *divergence* or *convergence* will not change in the performance of associated lateral or vertical* movements, as long as the object of fixation does not appreciably approach or recede from the eyes. For, for any given distance, the amount of convergent or of divergent action will be constant and the excess or deficiency of this action will also be constant, no matter whether the eyes are looking straight ahead, or laterally, or up or down. If, however, the distance of the object of fixation from the eye is altered, the amount of convergent or divergent action changes also, and in general the amount of deflection will change as well. Thus in a pure convergence-insufficiency the deviation will become more and more apparent as the limit of convergence is approached and will disappear altogether when the convergence is relaxed, *i. e.* when the patient is looking at a distance. In the case of a divergence-insufficiency the reverse will hold good.

In *anomalies of associated parallel movements* the motions of the eyes are strictly comitant, and in fact the visual lines remain everywhere parallel, since the ocular movements, while either restricted or in excess in some given direction, are restricted or in excess to the same degree in both eyes. For example, in a case of restricted sursumversion both eyes will fail to move up, but as the failure affects both to an equal degree, the visual lines will in the performance of this movement remain parallel up to the point where they cease to move at all.

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*This statement is not absolutely accurate, for, owing to the fact that the visual lines tend to diverge when the gaze is directed upward and to converge when they are directed downward, an exophoria otherwise comitant will show an increase in the upper and a decrease in the lower portions of the field of fixation.

The foregoing facts may be recapitulated as follows:

(1) *A deviation which increases or decreases in the performance of associated parallel movements by the eyes signifies an anomaly of one or more of the ocular muscles* — the direction in which it increases corresponding to that in which the action of the muscles affected is normally most pronounced.

(2) *A deviation which remains constant or nearly so while the eyes are performing parallel movements is due, not to an anomaly of individual muscles, but to an anomaly of some one of the associated movements of the eyes.*

(3) *A deviation which increases as the eyes are converged denotes a convergence-anomaly, and one which increases as the eyes are passing from convergence to parallelism a divergence-anomaly.*

Transformation of Non-comitant into Comitant Deviations. Non-comitancy in parallel movements might be remedied by restricting or increasing the action of the unaffected eye in the same sense as that in which the action of the affected eye is restricted or increased; *i. e.* by converting the anomaly from one of Class I. into one of Class II.

This is done in actual practice when, *e. g.* in a paralysis of the superior oblique of the right eye we tenotomize its associated antagonist, the inferior rectus of the other eye, thereby weakening the latter artificially in precisely the same sense and to the same extent that the right eye is weakened naturally. In nature a similar, though less perfect, result is commonly attained by the development of a spasm of the direct antagonist or of a pair of antagonistic muscles in the eye affected. Thus in a paralysis of the right externus, which produces a deviation confined to the right half of the field of fixation, is usually followed after a time by a spastic contraction of the right internus, which produces a deviation of the same character in the left half of the field of fixation. Thus the affected eye gets to squint inward, not only when looking to the right, but also when looking to the left, and the deviation, from being markedly non-comitant, becomes comitant or nearly so. A similar occurrence is regularly observed in paralysis of the other muscles.

A similar tendency to replace non-comitant by comitant deviations appears to prevail, although possibly to a less extent, in divergence and convergence anomalies. Thus a convergence-insufficiency, existing at first without any complication, is very apt later on to become associated with a divergence-excess, so that a sensibly constant deviation outward (exophoria) is present both for far and near, where originally it was present for near only. So also a convergence-excess may lead to a divergence-insufficiency, so that the esophoria which at first was marked only for near now becomes equally pronounced for distance. This compensatory process, by which comitancy is evolved out of a non-comitant state, is doubtless the reason for the many mixed forms of divergence and convergence anomalies that we meet with; and the process itself may actually be watched in following the development of many cases of squint.

The process in fact seems to take place so generally that it seems safe to enunciate the following law:

A non-comitant deviation usually tends to become comitant, there being superadded to the morbid condition already existing another by means of which the former is generalized and rendered sensibly equal throughout the whole field of fixation.

V.

ANOMALIES OF THE INDIVIDUAL MUSCLES.*

Hypokineses and Hyperkineses (Paretic and Spastic Squint). Over-action or under-action of the individual ocular muscles, giving rise to a disturbance of the normal balance of the eyes, may be due to

(a) Over or under-development of the muscle itself (structural squint, structural heterophoria).

(b) Variations in the origin, insertion and direction of the muscles and in the length of their tendons (insertional squint or heterophoria).

(c) Over or under-excitation of the muscle due to some affection of its nerve or nerve-nucleus (paretic and spastic squint and heterophoria).

The hypertrophy or the non-development of the muscles producing what I have called **structural deviation** is probably in many cases *congenital*. This is certainly so in those cases of defective elevation of the eye (frequently associated with ptosis) which have been proved by dissection to be due to absence of the superior rectus (Fuchs). I have seen one marked instance of this congenital anomaly in which ptosis co-existed with almost entire absence of elevation, and I am inclined to think that several other cases of less complete paralysis of elevation, which I have observed, were likewise congenital and structual in origin.*

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*This section, since its first presentation to the Prize Committee, has been largely added to and to a certain extent re-modeled.

Another class of cases of structural deviation, of quite frequent occurrence, are those which Schneller (Arch. für Ophth. xxiii. No. 3) describes under the name of *muscular strabismus*. Such, for example, are those cases of divergent strabismus in which, at the time of operation, we find the external rectus thick, broad and fleshy, and provided with a dense, broad tendon, while the internal rectus, on the contrary, is thin and has a narrow tendon, often split up into separate fibrils. Schneller in these cases found that the tendon of the externus, instead of being about equal to that of the internus†, was from one-fourth to one-third greater. In convergent strabismus, on the other hand, the ratio was reversed, the tendon of the externus being much thinner than that of the internus and the externus itself being comparatively meager and undeveloped.

Schneller reports thirty-four cases of such muscular (structural) strabismus. He regards them (probably with justice) as congenital in origin.

Others have supposed that these were cases of acquired atrophy (atrophy of disuse). But the pathological changes are those of simple non-development rather than atrophy, the muscular fibres being merely insufficient in number or size and showing no evidences of fatty or fibrous transformation nor of myositis.

The diagnostic features of a muscular squint, according to Schneller, are

(1) The deviation is not relieved by atropinization and correction of the refraction (distinction from accommodative convergence-excess and convergence-insufficiency).

(2) The field of fixation (*i. e.* the range of excursion of the eyes) is abnormally large in one direction and abnormally limited in the opposite. If the sum of the inward excursions of the two eyes exceeds the sum of the outward excursions by 30°, a convergent strabismus is produced; while a preponderance of outward excursions over inward excursions of 12° is sufficient to cause a divergent squint (Schneller).

This latter statement involves a fallacy, strictly speaking, if the range of excursion is, as is usually the case, determined by making the eyes follow a test-object situated within a foot or so of the eye.

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*See article by the author on "Paralysis of the Superior Rectus and Its Bearing upon the Theory of Muscular Insufficiency" (Archives of Ophthalmology, vol. xxiii., No. 1, 1884.)

†Schneller found the normal ratio between the breadth of the externus-tendon and the internus-tendon to be 102:100. His measurements were made so as to include more of the scleral attachments than in those made by other observers who have found the ratio to be 88 (Volkmann) and 89 (Fuchs).

For in this case when the eyes are directed to the right, the amount of excursion outward of the right eye = the absolute amount by which the externus can turn it outward (abduction) less the amount by which it is turned inward in order to converge upon the object (convergence). The latter (convergence) movement will be excessive either if the right internus acts too forcibly in response to an ordinary impulse of convergence (muscular excess) or if, the muscle being normal, the impulse itself is excessive (convergence-excess). In either case the net movement outward will be limited, even when the actual amount of abduction produced by the externus is normal. If, then, the case were one of simple convergence-excess the limitation of outward movement would be the same in looking to the right and in looking to the left; but if it were one of muscular squint, *i. e.* of actual insufficiency of the externi (or preponderance of the interni) the limitation might be either unilateral or bilateral. In the latter event the diagnosis of a muscular anomaly, as distinguished from a pure anomaly of convergence, would be substantiated if the limitation of abduction were found to be the same for all distances, far as well as near.

Degrees of weakness or of over-development, too slight to produce actual squint, probably form an important element in the causation of many cases of heterophoria (*structural heterophoria*).

Insertional squint or heterophoria, *i. e.* that sort of muscular under-action or over-action due to variations in the origin and insertion of the tendons, is difficult to distinguish from the structural deviations due to under or over-development of the muscular fibre itself. The structural deviations, however, are frequently congenital, while insertional squint is generally acquired. For example, a very important class of cases coming under the latter category are those in which the insertion of a tendon has been displaced by a *tenotomy* or an *advancement.* Here by the operation an insertional anomaly is produced; and the weakness or over-action resulting from this artificial anomaly is precisely similar in symptoms and objective signs to weakness or over-action due to natural causes (paresis or spasm, for example).*

Another class of cases in which there is an acquired insertional anomaly are those in which a *divergent strabismus has developed as a result of the gradual divergence of the orbits* taking place during the period of growth in childhood and youth. This divergence, by altering the angle of insertion of the tendons and the amount of tendon in contact with the eye-ball, increases very greatly the power of the externus and diminishes that of the internus, and in itself is quite sufficient to account for the development of the strabismus (see L. Weiss, Arch. f. Augenh. xxix. and Arch. of Oph. xxv. No. 3, 1896). The anomaly in this case is of great importance in that it exaggerates and renders uncertain the effect of a tenotomy of the interni when made upon children. Admitting Weiss's explanation of it, the obvious deduction would be that tenotomy of the interni should be avoided in children with convergent squint who have the orbits and eyes set very close together, since in these divergence of the orbits is likely to take place subsequently resulting in a preponderance of the externi, which will by itself suffice to correct the convergence.

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*Of the exactness of this similarity I have been able to convince myself by repeated examinations upon cases in which extensive operations had been made either upon the lateral or vertical muscles.

Other kinds of insertional anomalies exist, some so slight as to produce only a moderate degree of *heterophoria*, instead of a squint. They often develop when a non-comitant deviation has lasted for some time, and help to transform the latter into a deviation of the comitant variety.

Muscular paresis and spasms (Innervational Deviations). The subject of the **paralyses** of the eye muscles has been so thoroughly worked out and so ably presented by the two Graefes and Mauthner, that there is but little to add to this statement. The few points to which it seems necessary to call attention will be touched upon in the remarks on diagnosis.

Spasm of the individual ocular muscles may occur

(1) As an *evidence of a secondary deviation in a sound eye* when the other eye, being paretic, is yet used for fixation.

Thus suppose that a patient with a paresis of the right externus nevertheless fixes with the right eye because he sees better with it. Then when he looks at some object situated on his right he has to exert an excessive amount of force to turn his fixing eye out sufficiently. The same amount of force is, by the law of association, also transmitted to the left internus, and the latter, not being paretic, will respond with normal vigor to the excessive stimulus, so as to carry the left eye much further to the right than its fellow, and hence quite to the right of the object of fixation. In this case, as the right eye follows the object, and the left eye by an apparently excessive action shoots past it, we might regard the condition as one of veritable spasm of the left internus; whereas the real state of the case is that the latter muscle is normal and contracts excessively only because the stimulation that it receives is excessive. These cases are therefore correctly denominated as cases of *false* or *apparent spasm*.

(2) In the case of a paralysis of an ocular musle, *a spastic contraction of one or more of the other muscles in the*

same eye takes place, by virtue of which, as has been already stated, the deviation becomes more or less concomitant and generalized throughout the whole field of fixation. This contraction finally results in a permanent shortening (contracture) of the muscles affected, but before this stage has been reached, a temporary and varying spasm may be set up in the antagonists of the paralyzed muscle, so as to carry the deviation and the diplopia far outside of the field of action of the latter. This was clearly shown in the following case which came under my care:

Paralysis of Inferior Rectus. Varying Spasm of Superior Rectus of same eye. H., male, aged 29. Vertigo, blurring of sight, and diplopia for past two years. No history of syphilis. Presents all the evidences (by inspection, screen, and diplopia tests) of a well-marked paresis of the R. inferior rectus. Vertical diplopia (with image of right eye below = DR) increasing to 6° to 7° (= 14° prism) as the eyes are carried down and to the right; diminishing to zero when the gaze was directed down and to the left. Moderate crossed diplopia everywhere; increasing when eyes are directed down and to left. Vertical diplopia of the same character as that found in the lower field prevailed, although to a less extent in the upper field; most marked in looking up and to the right (Eu & r, DR ⊳⊳). This diplopia in the upper field varying much, and partially superable by voluntary effort.

Here there was evidently a spasm (variable in amount) of the right elevators, and particularly of the right superior rectus (shown by the fact of the vertical diplopia increasing upward and to the *right*). The vertical diplopia in the upper part of the field might, it is true, have been due to a paresis of the elevators of the left eye; but the variable character of the diplopia and the fact that it was superable by voluntary effort negative this supposition.

(3) Spasm (usually slight) of one or more of the ocular muscles may occur as the result of *irritative lesions at the base of the brain*, particularly meningitis.

(4) Slight transient spasm may occur in *chorea*.

(5) Convulsive tonic spasm may occur in *epilepsy* and *hysteria*, although in these diseases it is not generally the individual muscles that are affected, but the associated movements of the eyes (particularly the parallel movements and movements of convergence). Gowers, however (Diseases of the Nervous System), calls attention to a sort of convulsive seizure that may be styled epileptoid, in which there are suddenly developing tonic and clonic spasms of one or more ocular muscles, associated with more or less obtunding of the consciousness.

(6) Finally we may have cases of *non-paroxysmal and chronic spasm of some one ocular muscle*, which causes the

eye to make an excessive movement as soon as it is turned so that the affected muscle can act upon it. Thus cases have been described in which a spasm of the external rectus caused the eye to shoot far outward as soon as the eye was turned past the middle line. Mauthner (Augenmuskellähmungen) casts doubt on all such cases, regarding them as probably instances of secondary deviation of a sound eye due to the fact that the other eye is paretic but still performs fixation, so that an excessive impulse is transmitted to both eyes. That is, he would class all such cases under the category of false or apparent spasm (Group 1 mentioned above). But this statement is certainly too sweeping, since cases of chronic spasm, although doubtless rare, do occur, as witness the following that I observed:

Paralysis of L. Externus; Spasm of L. Inferior Oblique. Bertha S., aged 8. Deviation of eyes noticed since birth. Used to hold head to right and does so still when looking intently at anything. L. eye cannot move out beyond median line. When eyes are carried horrizontally to the right, *L. eye suddenly flies upward and becomes buried beneath the upper lid.* In associated movements in lower field, L. eye moves normally with the R. Behind screen L. eye deviates high up and somewhat in. Deviation of either eye behind screen about equal. No double images attainable. V. R. $^{20}/_{40}$: with +1.00 D. $^{20}/_{30}$. L. $^{20}/_{70}$.

Here the sudden and excessive upward movement of the left eye when directed inward could only have been effected by a spasmodic contraction of the inferior oblique: the superior rectus acting but slightly as an elevator when the eye is adducted.

A similar case in which with **paralysis of the R. externus and R. superior rectus** there was **spasm of the R. superior oblique** is the following:

Emma D., aged 15. Strabismus since scarlatina eleven years before. Occasional vertigo: no diplopia. Movements of L. eye normal. R. eye cannot move at all to right, nor upward and to right; movement upward almost normal when eyes are carried to left (retention of power of inferior oblique); movement downward excessive, especially when eyes are directed to left (excessive action of superior oblique); when attempt is made to move eyes straight to left, R. eye shoots obliquely down and to the left (spasmodic action of superior oblique).

In addition to these cases in which spasm was associated with paralysis, I have seen others in which a deviation limited to one portion of the field of fixation was present, which deviation was always marked but yet *varied so much in amount* from one time of observation to another as to necessitate the assumption of its being spasmodic rather than paralytic in origin.

Symptoms and Differential Diagnosis of the Different Varieties of Muscular Over-action and Under-action. No attempt will be made here to go at all fully into the symptoms produced by insufficiency or over-action of the individual muscles. This has already been done in various excellent treatises. I will simply give the following facts to which, as I conceive, too little attention has been paid.

1. In the deviations considered in the foregoing paragraphs the abnormality, as has been pointed out, may affect either the muscle itself, its tendon, or the nerve and nerve-nucleus supplying it; *i. e.* the muscle may act above or under the normal either because it is itself too much or too little developed (Structural Deviation); or because the direction and insertion of its tendons are not what they should be (Insertional Deviation); or because the muscle is in a state of paralysis or spasm (Innervational—Paretic or Spastic—Deviation). Now it cannot be too strongly insisted upon that *these three varieties, however dissimilar in origin, show in their symptoms and objective signs no real point of difference.* Thus weakness of the external rectus, whether arising from feeble and arrested development of the muscular fibre, or from mal-position of the tendon (natural or produced by a tenotomy), or from lesion of the sixth nerve, gives rise to the same symptoms and offers the same appearances to objective examination. The characters of the paretic and spastic deviations, to be sure, are generally more definite and more striking than are those of the other anomalies mentioned, but this is simply owing to the fact that such cases are usually seen early, before any compensatory changes have taken place and while the diplopia, false projection, vertigo, and other symptoms are therefore still marked. Precisely the same effect will be produced in a patient with binocular single vision if one of the tendons is completely divided. And in cases of long standing—particularly in congenital cases—it is impossible to say with certainty from the symptoms alone without reference to the history whether faulty innervation, faulty insertion, or faulty structure lies at the basis of the anomaly.

2. *Congenital deviations* present several peculiarities. In the first place they cause little or no trouble for the obvious reason that the patient from his infancy has learned to adjust himself to the anomalous condition present. Again, it is remarkable that, even after the condition has

existed for years, there is no constant suppression of the diplopia such as occurs in comitant squint, and furthermore, there is no tendency, as in the case of other non-comitant deviations, to a transformation into a comitant deviation by the development of a contracture of the antagonists. The reason probably is that as the patient has never known any different condition from that which he was born with, and as this condition consequently is the natural one for him, he experiences no inconvenience from its continuance, so that no involuntary tendency is set up toward its rectification. The result is that these congenital deviations, which may be due either to paresis or to a structural defect, afford, as far as objective signs go, the most typical picture of uncomplicated muscular paralysis that we can have.

3. *Acquired muscular deviations*, on the other hand, whether due to anomalies of innervation or insertion, always tend to become *comitant;* this being affected by a gradually developing contracture of the antagonists when the affected muscle is too weak, and by a weakening of the antagonists when the affected muscle is too strong. It is thus, probably, that many cases of comitant strabismus convergens and strabismus divergens are produced; and the few cases of strabismus sursumvergens that I have met with were apparently all developed in this way.

Thus paralysis of the R. elevators, when not of congenital origin, is regularly followed by spasm of the R. depressors, causing the right eye to stand lower than the other in all portions of the field of fixation. This process continuing and the spasm developing into a confirmed contracture, the difference in height between the two eyes (L. hypertropia) becomes equal for all directions of the gaze; the limitation of movement of the right eye upward is compensated for by a corresponding increase in its movements downward: and the picture of a typical comitant *strabismus deorsumvergens* is produced.

If but one of the elevators, *e. g.* the superior rectus, is paretic the spasm is apt to be confined, in the first instance at least, to the corresponding depressor, *i. e.* the inferior rectus. In this case the deviation will become half-comitant, that is, comitant for movements up and down but not for lateral movements. Thus, if the right superior rectus were the paretic muscle, we should have first a L. hyperphoria, very marked in the upper right-hand quadrant of the field of fixation and diminishing rapidly, both when the eyes were carried down and when they were carried to the left. Later, when spasm of the right inferior rectus had developed, the L hyperphoria would become pronounced in the lower right-hand quadrant also, and ultimately so much so that whether the eyes were carried up or down, the right eye would always stand about the same distance below the left. But in both the upper and lower portions of the field the L. hyperphoria) would still increase as the eyes were carried to the right and diminish to zero as they were carried to the left: so that even under these circumstances the deviation would not be comitant for lateral movements.

A case of this sort, in which the inferior rectus was the muscle primarily affected and in which semi-comitancy was being developed by spasmodic action of the superior rectus has already been mentioned (under the head of Spasm of the Ocular Muscles).

Cases in which a comitant (and even an alternating) *lateral squint* has developed out of a paresis of the externus, followed by contracture of the internus and later by partial restoration of the power of the externus, have been reported by Spicer ("Royal London Ophth. Hosp. Reports," xiv. 1, 1895). I have observed analogous cases, particularly one in which a partial oculomotor paralysis with secondary contracture of the externus had resulted in a nearly comitant strabismus divergens.

In proportion as the deviation becomes transformed from a non-comitant to a comitant one, the symptoms grow less disturbing; for, as already stated, it is always the case that, other things being equal, a comitant deviation will give less trouble than will one that is non-comitant.

4. The *diagnosis between over-action and under-action* is often difficult. Theoretically, over-action (spasm) is associated with excessive movement, and under-action (paresis) with very deficient movement in some one direction. But, unless the paralysis is nearly total or the spasm is great, it is not always easy to say whether it is the muscle of one eye that is under-acting or whether it is the associated antagonist of the other eye that is over-acting; and when secondary changes have taken place, transforming the deviation into a comitant one, the diagnosis is often impossible.

Before this has occurred the differentiation may be made from the following considerations.

OVER-ACTION.	UNDER-ACTION.
Points in Common.	
One eye moves faster and further than the other when both are carried in some one particular direction; and this discrepancy between the position of the eyes and also the diplopia, false projection, and vertigo become more and more pronounced, the further the eyes are carried in that direction. The primary position for both eyes is nearly the same.	
The absolute excursion of the faster moving eye in the given direction is greater than normal; that of the other eye is normal.	The absolute excursion of the faster moving eye is normal in all directions; that of the other eye is subnormal.

The total excursion of the faster moving eye in the given direction and in its opposite is greater than normal: *i. e.*, the field of fixation is excessively large in one of its diameters.	The total excursion of the faster moving eye is normal, that of the other eye is subnormal: *i. e.*, the field of fixation of the latter is contracted in one of its diameters.
Fixation is usually performed by the slower moving eye.	Fixation usually performed by the faster moving eye.
The amount of deviation may show great and sudden changes from time to time.	The amount of deviation remains constant or changes slowly and progressively.

5. While the diagnosis of a marked underaction of one of the ocular muscles usually presents no difficulty, there is quite a large number of cases in which the condition is not so obvious, the *weakness of the muscles being comparatively slight.** In these cases diplopia does not occur until the eyes are removed some distance (10° to 20°) from the primary position. As soon as it does appear, however, it develops in a perfectly typical fashion, showing marked increase in some one special direction and diminishing elsewhere to zero. Most cases of this sort of anomaly, that I have observed, have been those in which there was a pretty pronounced weakness (perhaps of congenital origin or, rather, due to non-development) of the superior rectus; less frequently the inferior rectus seemed involved. The nature and course of these cases have not been thoroughly investigated, but it is noticeable that they are frequently associated with a convergence-insufficiency which shows a tendency to go over into a divergence-excess, resulting, in sone instances at least, in a regular divergent squint. The chief symptoms (which, however, are, very likely, attributable to the convergence-insufficiency) are conjunctival irritation, asthenopia (often very marked), headache, and diplopia. In many cases the symptoms are insignificant and this fact coupled with the absence of diplopia in the primary position is probably the reason why these cases have been left uninvestigated. Quite a number of cases of hyperphoria doubtless belong to this category.

Another variety of muscular weakness, transitory in its character, is that already referred to as associated with *neurasthenia*. Here we may find diplopia all round the periphery of the field of fixation, *i. e.* within 35° of the primary position (Concentric contraction of the field of binocular single vision). This condition would appear to have little significance except as a diagnostic sign of the condition with which it is associated.

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*It is to these cases that the old term muscular insufficiency should be limited.

It is not unlikely that *slight degrees of muscular spasm* are at the bottom of some of the cases of heterophoria that we meet with; *e. g.* spasm of either one of the elevators or of either one of the depressors may occasion a hyperphoria of more or less varying character (*Spastic heterophoria*). I have notes of five or six cases in which the presence of a varying and even alternating hyperphoria seemed to be due to more or less spasmodic contraction of the vertical muscles.

Finally it is quite likely that a large number of cases of slight deviation are due to *moderate under-action of one muscle combined with over-action* (secondary spasm) of another, so as to produce a more or less comitant deflection. Probably most of the cases of hyperphoria, in which the deviation, although moderate in amount, is present through the whole field of fixation, are attributable to combined anomalies of this sort (*comitant hyperphoria*). Cases of this kind often give rise to asthenopia, headache, neuralgia, and sometimes to gastric disturbance and impairment of nutrition. Diplopia is infrequent and when present can usually be readily overcome.

6. The diagnosis of the muscles affected in a case of paralysis or spasm is readily *accomplished by means of the double images* if the following principles are kept in mind.

(a) The diplopia increases progressively as the eyes are carried in that direction in which the action of the muscle affected is normally most pronounced.

(b) Paralysis of any given muscle of one eye produces diplopia of the same character and increasing in the same way as does a spasm of the associated antagonist in the other eye.

(c) While paresis or spasm of one of the vertical muscles does produce lateral diplopia, this diplopia may be and often is neutralized by the existence of other factors, so that it is of no practical significance in the diagnosis. The latter must rest solely upon the difference in height of the double images and the portion of the field where this difference is most pronounced.

This fact, enunciated and explained very clearly by Mauthner, is frequently overlooked, many insisting that paresis of the superior and inferior recti must produce crossed, and paresis of the obliques homonymous diplopia. But, apart from the fact that these pareses are often associated with exophoria or esophoria of sufficient amount to neutralize their lateral diplopia, the natural tendency which the visual axes display to diverge when the eyes are directed up and to converge when they are directed down will work to abrogate the homonymous diplopia due to a paresis of the inferior oblique and the crossed diplopia due to a paresis of the rectus. As a matter of fact I have found paresis of the superior and inferior recti often associated with homonymous diplopia.

The following table, constructed in accordance with the three principles just enunciated, shows succinctly the way in which the diagnosis can be made from the double images.

DIAGNOSTIC TABLE

of Paralysis and Spasm of the Ocular Muscles.

NOTE. DH = homonymous diplopia; DX = crossed diplopia; DR = vertical diplopia with the image formed by the right eye below; DL = vertical diplopia with the image formed by the left eye below. Eu. Ed. Er. El. Eu & r. etc., = associated parallel movements in which the eyes are directed respectively up (Eyes up) down, right, left, up and right, etc. ≻≻ = increasing; ≺≺ = decreasing.

DIPLOPIA			= PARESIS OF	OR = SPASM OF
Er. DH	≻≻	greatly.	R. External Rectus	L. Internal Rectus
Er. DX	"	"	L. Internal Rectus	R. External Rectus
El. DH	"	"	L. External Rectus	R. Internal Rectus
El. DX	"	"	R. Internal Rectus	L. External Rectus
Eu. & r. DL	"	"	R. Superior Rectus	L Inferior Oblique
Eu. & r. DR	"	"	L. Inferior Oblique	R. Superior Rectus
Eu. & l. DR	"	"	L. Superior Rectus	R. Inferior Oblique
Eu. & l. DL	"	"	R. Inferior Oblique	L. Superior Rectus
Ed. & r. DR	"	"	R. Inferior Rectus	L. Superior Oblique
Ed. & r. DL	"	"	L. Superior Oblique	R. Inferior Rectus
Ed. & l DR	"	"	R. Superior Oblique	L. Inferior Rectus
Ed. & l. DL	"	"	L. Inferior Rectus	R. Superior Oblique

The above table is sufficient for all ordinary working purposes, but for the sake of completeness I give also the more extensive one subjoined, which I have devised to show how the character of the diplopia may be modified by circumstances.

TABLE OF DIPLOPIA.

A. HOMONYMOUS DIPLOPIA VARYING WITH DIFFERENT DIRECTIONS OF THE GAZE.

I. Variation great = Paresis of Externus (Spasm of Internus.)

CHARACTER OF DIPLOPIA	INDICATES PARESIS OF	OR SPASM OF
DII ⊳⊳ in Er, ⊲⊲ in El.	R. External Rectus	L. Internal Rectus
DII ⊳⊳ in El, ⊲⊲ in Er.	L. External Rectus	R. Internal Rectus

II. Variation slight = Paresis of Oblique (Spasm of Superior or Inferior Rectus) or a comitant esophoria associated with a condition causing varying DX.

DII ⊳⊳ in Er.	Particularly marked in Eu. [Eu. & r.]	R. Inferior Oblique R. Superior Rectus	L. Superior Rectus L. Inferior Oblique
	Particularly marked in Ed. [Ed. & r.]	R. Superior Oblique R. Inferior Rectus	L. Inferior Rectus L. Superior Oblique
DII ⊳⊳ in El.	Particularly marked in Eu. [Eu. & l.]	L. Inferior Oblique L. Superior Rectus	R. Superior Rectus R. Inferior Oblique
	Particularly marked in Ed. [Ed. & l.]	L. Superior Oblique L. Inferior Rectus	R. Inferior Rectus R. Superior Oblique

B. CROSSED DIPLOPIA VARYING IN DIFFERENT DIRECTIONS OF THE GAZE.

I. Variation great = Paresis of Internus (Spasm of Externus.)

CHARACTER OF DIPLOPIA	= PARESIS OF	OR SPASM OF
DX ⊳⊳ in Er., ⊲⊲ in El.	L. Internal Rectus	R. External Rectus
D ⊳⊳ in El., ⊲⊲ in Er.	R. Internal Rectus	L. External Rectus

II. Variation slight = Paresis of a Superior or Inferior Rectus (Spasm of an Oblique) or a comitant exophoria associated with a condition causing varying DII.

DX ⊳⊳ in Er. ⊲⊲ in El.	Particularly marked in Eu. [Eu. & r.]	L. Superior Rectus L. Superior Oblique	R. Inferior Oblique R. Superior Rectus
	Particularly marked in Ed. Ed. & r.]	L. Inferior Rectus L. Superior Oblique	R. Superior Oblique R. Inferior Rectus
DX ⊳⊳ in El. ⊲⊲ in El.	Particularly marked in Eu. [Eu. & l.]	R. Superior Rectus R. Inferior Oblique	L. Inferior Oblique L. Superior Rectus
	Particularly marked in Ed. [Ed. & l.]	R. Inferior Rectus R. Superior Oblique	L. Superior Oblique L. Inferior Rectus

C. VERTICAL DIPLOPIA VARYING IN DIFFERENT DIRECTIONS OF THE GAZE (= PARESIS OR SPASM OF ELEVATOR OR DEPRESSOR.

I. Diplopia ⊵⊵ in Eu. (Paresis or Spasm of Elevator.)

CHARACTER OF DIPLOPIA		PARESIS OF	OR SPASM OF
DR ⊵⊵ in Eu.	DR. most marked in Eu. & r. [regularly associated with DII ⊵⊵ in Eu. & l.]	L. Inferior Oblique	R. Superior Rectus
	DR. most marked in Eu. & l. [regularly associated with DX ⊵⊵ in Eu. & r.]	L. Superior Rectus	R. Inferior Oblique
DL ⊵⊵ in Eu.	DL most marked in Eu. & r. [regularly associated with DX ⊵⊵ in Eu. & l.]	R. Superior Rectus	L. Inferior Oblique
	DL most marked in Eu. & l. [regularly associated with DII ⊵⊵ in Eu. & r.]	R. Inferior Oblique	L. Superior Rectus

II. Diplopia ⊵⊵ in Ed. (= Paresis or Spasm of Depressor).

DR ⊵⊵ in Ed.	DR most marked in Ed. & r. [regularly associated with DX ⊵⊵ in Ed. & l.]	R. Inferior Rectus	L. Superior Oblique
	DR most marked in Ed. & l. regularly associated with DII ⊵⊵ in Ed. & r.]	R. Superior Oblique	L. Inferior Rectus
DL ⊵⊵ in Ed	DL most marked in Ed. & l. [regularly associated with DII ⊵⊵ in Ed. &l.]	L. Superior Oblique	R. Inferior Rectus
	DL most marked in Ed. & l.regular associated with DX⊵⊵ in Ed. & r.	L. Inferior Rectus	R. Superior Oblique

From the foregoing table the following facts are apparent:

(1) *An homonymous diplopia, whether large or small, which increases as the eyes are carried to the right indicates under-action of* SOME *muscle of the right eye or over-action of* SOME *muscle of the left.*

(2) *A crossed diplopia which increases as the eyes are carried to the right indicates under-action of* SOME *muscle of the left eye or over-action of* SOME *muscle of the right.*

Treatment of Anomalies of the Individual Muscles. 1. In every case of over-action or under-action of the muscles our first attempts must be directed to removing the *cause* of the trouble. This is effected with more or less success in syphilitic paralysis and in the paralysis caused by the pressure of meningitic effusions upon the nerves when we employ the iodides and mercury; in the so-called rheumatic paralysis, due apparently to exposure to cold, when we use sodium salicylate and the iodides; and when in hysterical disorders we employ the appropriate moral treatment.

2. When the cause is unknown or cannot be reached, an *expectant* treatment combined with *corroborant measures* (especially open-air exercise) must be employed. This is particularly the course to be pursued in spastic deviations, in hysterical and diphtheritic paralysis, and in the limitation of the movements of the eye due to neurasthenia.

The use of *strychnine*, advocated by some as being a direct tonic for insufficient muscles, seems to be efficient only so far as it acts to improve the patient's general condition. The same may be said of *electricity*.

3. When the deflection is slight, confirmed, and especially if it is more or less comitant, *prisms* often do good service, particularly in the vertical deviations.

In the lateral deviations they are of less service, because these are frequently complicated by the presence of divergence or convergence anomalies, in which the prolonged use of prisms is distinctly injurious.

4. *Operative measures* are to be adopted only when we are assured that the condition has reached a stage in which it is no longer likely to undergo change. Even in long-standing cases of paralysis it may be dangerous to operate, since the paralysis may disappear even after lasting for months, and then the operation which previously sufficed to correct the deviation will now over-correct or produce a deviation in the opposite sense which may be worse than the original one.

On the other hand, the judicious division of a contractured unparalyzed muscle may by giving the paralyzed muscle more play assist in restoring the power in the latter. See two cases by Chevallereau (Trans. of VIII. Internat. Ophth. Congress, Edinburgh, 1894) in which the movements of an eye the subject of a partial oculomotor paralysis were restored by tenotomy of the unparalyzed externus. These cases are analogous to those in which the power of the externi, weakened by persistent contracture of interni due to a convergence-spasm, is gradually restored by the very prolonged use of the proper correcting glasses which relieve the spasm and allow the externi to act more freely. (See Long and Barret's cases, cited in section VII.)

In any case care must be taken that the *appropriate operation* is performed. The principles of operating, which were admirably enunciated by A. Graefe, may be thus stated:

Over-action of a muscle is to be relieved by tenotomy of the over-acting muscle. *Under-action* is to be relieved by tenotomy of the associated antagonist to the under-acting muscle, or, where this is impracticable, by advancement of the under-acting muscle itself. Sometimes, especially in paralysis of the externus and internus, these operations have to be further reinforced by tenotomy of the direct antagonist of the paralyzed muscle.

The reason for these rules is obvious. When a muscle is too strong we can reduce its action more or less effectively by a tenotomy. If the muscle is too weak, but yet retains some of its power, we can increase this power by performing an advancement. If, however, the muscle has lost all power, an advancement is obviously futile, and if the muscle acts but little an advancement alone is generally insufficient. Then we have only to remember that when a muscle is too weak, the effect upon the movements of the two eyes is the same as if the associated antagonist in the other eye was too strong; and if we tenotomize this antagonist, we shall limit the movement of the sound eye in the same sense and to the same extent as that in which the movement of the affected eye is already limited, *i. e.* both eyes will again move equally with each other, although the movement of neither will be normal. If no secondary changes have taken place, tenotomy of the associated antagonist alone may suffice, but usually the weakened muscle is opposed by a contractured and hence over-acting muscle in the same eye (direct antagonist), and therefore we may have also to divide the latter in order to secure the proper balance of action.

For the particular cases these rules may be expanded as follows:

Under-action of the R. externus indicates tenotomy of the L. internus, usually combined with advancement of the R. externus and often with tenotomy of the R. internus.

Under-action of the R. internus requires advancement of the R. internus combined with tenotomy of both externi.

The advancement in this case is imperatively demanded, because the internus has to be used in convergence as well as in associated parallel movements. For the latter it might act sufficiently well, even if intrinsically weak, provided the externus of the other eye was also weakened and to the same extent; but for the proper performance of convergence movements the internus requires to be intrinsically strong, which can be effected only by an advancement.

Under-action of the R. superior oblique requires tenotomy of L. inferior rectus. This operation gives very satisfactory results.

Under-action of the R. inferior oblique requires tenotomy of the L. superior rectus.

Under-action of the R. superior rectus is in general best remedied by advancement of the muscle itself. If there is secondary contracture of the inferior rectus, the latter may be divided also, but this operation should be performed with considerable caution owing to the unpleasant effects produced by insufficiency of any one of the depressor muscles.

In very slight cases of insufficiency of the superior rectus in which the increase of the diplopia in lateral directions of the gaze would not be very great, and in which the aim is simply to remove the moderate hyperphoria in looking straight ahead, cautious tenotomy of the superior rectus of the other eye may replace the operation of advancement.

Under-action of the R. inferior rectus requires advancement of the muscle itself, which may need to be supplemented by tenotomy of the R. superior rectus.

Over-action of either one of the four recti is remedied by advancement of the over-acting muscle.

Over-action of the R. superior oblique calls for advancement of the L. inferior rectus. In very slight cases this operation may be replaced by a cautious tenotomy of the R. inferior rectus.

Over-action of the R. inferior oblique is relieved by advancement of the L. superior rectus or, in very slight cases, tenotomy of the R. superior rectus.

It is probably from a failure to conform to these principles that a large part of the disappointment occasioned by the results of tenotomies done for heterophoria is due. For example, a L. hyperphoria due to insufficiency of a R. elevator muscle is treated by tenotomizing the R. inferior rectus. This operation does not essentially relieve the limitation of movement in the upper field, which really caused the hyperphoria and most likely the symptoms ascribed to the latter; on the contrary, it adds to the condition already existing a new and very troublesome pathological condition, namely, a limitation of the movements of the right eye in the lower field also. In other words, to the paresis already present another paresis has been added by operation, and the patient suffers from the combined effects of both. That the effect of both pareses actually co-exist can readily be demonstrated by an examination of the double images. It will be found that the diplopia in the upper field has not been materially reduced by the operation, while a diplopia which did not exist before has been introduced into the lower field and gives rise to much disturbance. In this case advancement of the weak elevator in the affected eye or tenotomy of the elevator in the other eye would be the proper operation.

Parakineses. Tremor of Individual Ocular Muscles (Unilateral or Non-symmetrical Nystagmus). The tremulous movement (alternating spasm) that we denote by the name of nystagmus, although usually affecting equally the associated muscles in the two eyes, and therefore dependent in all probability upon a lesion of the association-centers, may be confined to the muscles of one eye or be of a different character in one eye from that in the other.

Hence, while ordinarily constituting a perversion of the associated parallel movements of the eyes, in these cases it must be regarded as a perversion of the movements of the individual muscles. These cases, are, to be sure, quite rare. Graefe (Graefe-Saemisch) reports four cases of unilateral vertical nystagmus (two observed by himself), and adds that, while he has seen cases of slight rotary nystagmus confined to one eye, he has never met with one of unilateral horizontal nystagmus. Frost, however (Trans. Ophth. Soc. of United Kingdom, xiv. 245), reports a case of acquired nystagmus in which the oscillations were horizontal in one eye and vertical and rotary in the other.

VI.

ANOMALIES OF ASSOCIATED PARALLEL MOVEMENTS.

Hypokineses. Paresis and Insufficiency of Associated Parallel Movements. *Paralysis of the lateral associated movements* of the eyes is not infrequent in destructive cerebral disease, particularly apoplexy, the sight of the lesion in paralysis of dextroversion being in the left, and in paralysis of sinistroversion in the right half of the brain. In pure cases of this sort the power of convergence is retained, showing that the internal rectus, although incapacitated as far as continuous action with the opposite externus is concerned, is not disabled from performing work in conjunction with its fellow internus. This shows that in these cases we are not dealing with a conjoined paralysis of one externus and one internus, but with an inhibition of one particular *movement* of the eyes.

Paralysis of sursumversion (without any involvement of the lateral movements) and *paralysis of sursumversion and deorsumversion together* have been observed (Gowers; Sauvineau, Trans. of VIII. Ophth. Congress, Edinburgh, 1894).

Except as diagnostic signs of the condition causing them these associated deviations are of little clinical importance. Whether there are slighter grades of these disorders, not dependent upon severe structural disease and possibly productive of more symptoms on their own account, has not, as far as I know, been positively demonstrated.

Certain cases, however, demonstrated by Savage (Oph. Record, Jan., 1896) under the name of Asthenic vertical orthophoria in which the combined up-and-down movements of both eyes (sursumversion and deorsumversion) were performed insufficiently and with difficulty would seem to belong in this category: and possibly the explanation of the conditions called by Stevens Anatropia and Catatropia may be had by assuming a weakness of deorsumversion in the former case and of sursumversion in the latter, so that in either instance both visual lines are off the proper level (see section IX).

Hyperkinesis. Spasm of Associated Parallel Movements.

Spasm of the associated lateral movements producing deviation of both eyes to the right (Spastic dextroversion) or to the left (Spastic sinistroversion) is not infrequently observed as the result of irritative lesions of the brain. Deviation to the right is produced by disease of the left side of the brain and *vice versa*.

Spasm of associated movements (particularly, combined vertical and lateral spasm, producing oblique deflections of both visual lines) also occurs as a transient and paroxysmal manifestation in epilepsy and hysteria.

The curious case described by Frost (Trans. Ophth. Soc. United Kingdom), in which there was spastic deviation of both eyes down and to the right, but in which there was no actual impairment of the movements of either eye by itself, was apparently hysterical in character.

The following peculiar case of *alternating spasm of associated parallel movements* was apparently choreiform in character and would seem to form a sort of connecting link between cases of tonic spasm, such as those just mentioned, and true nystagmus.

Choreiform Spasm of Associated Oblique Movements.

Simon N., aged 13 years, came under my care Nov. 22, 1892. Chorea two years ago. Anæmic. Now shows every few minutes, especially when watched, sudden darting movements of both eyes upward and to the right and back again. The return movement takes place in two phases, the eyes shooting down and to the left somewhat beyond the primary position, and then by a sharp jerky motion coming up again to the latter. If the gaze is directed to the left, both eyes dart upward and to the *left* and then back again. In either case, whether moving up and to the right or up and to the left, the direction of the movement is at an angle of 45° with the horizontal, and the eyes are carried up until the pupils are three-quarters buried beneath the upper lids. Slight choreiform twitchings of the face accompany the movements.

Orthophoria. No diplopia. Associated movements, although sluggish, perfectly normal.

V. R. $^{15}/_{15}$ L. $^{15}/_{70}$. Under homatropine. R. + 1.00 D. $^{15}/_{15}$; L. + 1.50 D. Cyl. Ax. 85° T. $^{15}/_{30}$.

Three weeks treatment with arsenic and hydrochloric acid effected no improvement. On Jan. 15, 1893, R. + 0. 75 D. Sph., L. + 1.50 D. Cyl. Ax. 85° T. given. Patient then passed from observation and has not been seen since.

Except for the long interval between the separate spasmodic movements, the appearances presented in this case differ in no respect from those observed in nystagmus. Its development, however, in a patient with fair sight and normal muscles, and the past history and present evidences of chorea led me to regard it not as a true nystagmus. If nystagmus at all, it was a very rare form of the affection.

Parakineses. Tremor of Associated Parallel Movements (Nystagmus). Nystagmus, as ordinarily met with, consists of an equal and parallel movement of the two eyes, both executing a series of rapid oscillations in the same direction and at the same time. These oscillations, which vary in frequency from 30 to 150 a minute, occur in two phases, a rapid darting movement first taking place in a certain direction and this being followed by a movement of return to and beyond the original position of the eyes. The latter or second phase, although slower than the first, is evidently an active movement and not a mere relaxation of the muscles that have just been spasmodically contracted. The direction of the movement is usually from side to side *(Horizontal nystagmus)*, sometimes rotary, both vertical meridians revolving in the same direction *(Rotary nystagmus)*, and very rarely vertical *(Vertical nystagmus)*. Not infrequently combinations of two, or even of all three forms are observed *(Mixed nystagmus)*.

Movements of this character point to a pathological condition of the association-centres, causing the discharge of alternate and excessive stimuli from the latter instead of the simultaneous and equal stimuli of moderate intensity, which enable the normal eye to remain steady in the position of fixation.

The eyes ordinarily, when looking at an object straight ahead of them, are kept in place by simultaneous contraction of the opposing muscles; *i. e.* they move neither to the right nor to the left, because they receive equal and simultaneous impulses from the centre for right-handed movements (dextroversion) and that for left-handed movements (sinistroversion).

If, however, these impulses, instead of being simultaneous, are alternate, so that the eyes first receive an impulse from the centre for dextroversion and then one from the centre for sinistroversion, and if these impulses alternate rapidly, we shall have the picture of *horizontal* nystagmus.

A similar want of simultaneity in the discharge of impulses from the centres for sursumversion and deorsumversion will produce a *ver-*

tical nystagmus. And a *rotary* nystagmus will result from the discharge of alternate instead of simultaneous stimuli from the centres* which produce rotation of both vertical meridians to the right and to the left respectively. Finally, a combination of some or all of these anomalies accounts for the various forms of *mixed* nystagmus.

This conception of the *central origin* of nystagmus, and more particularly of its origin from some lesion of the different association-centres, seems forced upon us, not only by the character of the movements executed, but also by a great variety of pathological data. For further information as to the latter, reference may be made to the exhaustive articles by Graefe (Graefe-Saemisch and Arch. für Ophth., xxiv. 3, 1895).

VII.

ANOMALIES OF CONVERGENCE.

Hypokineses. Paralysis and Insufficiency of Convergence. Absolute loss of power of convergence with retention of the power of making associated parallel movements has been occasionally observed. Since either eye can still be turned inward when acting with its fellow to move to the right or to the left, these cases cannot be referred to paralysis of the interni, but indicate some lesion of the convergence-centre, causing a **paralysis of convergence** (*Parallel squint* of Schneller).

Cases of this sort in which the paralysis was total or practically so (convergence near-point at from 2 to 6 metres), have been described as well as others in which the paralysis was marked but not complete. I myself have seen one case of the sort.

The paralysis is frequently associated with paralysis of accommodation and in some of Parinaud's and Sauvineau's cases was accompanied by paralysis of sursumversion and deorsumversion. One peculiar feature is that the prism-convergence (*i. e.* the power of overcoming prisms, base out) is retained in some of the cases (Straub).

The cases hitherto reported are:

Schweigger, Klin. Untersuch. über das Schielen 1881 (cited by Straub) 2 cases.

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*Inferred to exist from this very symptom. The right-rotating centre, acting by itself, would produce simultaneous contraction of the right inferior oblique and inferior rectus and of the left superior oblique and superior rectus; and the left-rotating centre would similarly produce contraction of both inferior muscles of the left and both superior muscles of the right eye.

Parinaud, Arch. de Neurologie, 1883 (cited by Sauvineau).

Sales, Trans. Ophth. Soc. United Kingdom, iv. (1884), p. 390 (cited by Gowers).

Parinaud, Brain, ix. 330. 1887 (cited by Straub), 5 cases.

Stölting and Bruns, Arch. für Ophth. xxxiv. 3, 1888 (cited by Straub).

Benzler, Deutsch. militär-aerztl. Zeitschr., xviii. (cited by Straub).

Peters, Centralbl. f. pract. Augenheilk., xiii. (cited by Straub).

Sauvineau, Trans. VIII. Internat. Ophth. Congress, Edinburgh, 1894.

Straub, M., Arch. of Ophth., xxv. 3 (1896).

Hayne, H. W., ib.

Graefe's 10 cases (cited by Straub) came rather under the head of convergence insufficiency than actual paralysis.

Much more frequent and important are those cases in which there is simply a greater or less weakness of convergence (**Convergence=insufficiency**). A. Graefe, who regarded these cases as quite rare, gives an excellent exposition of some ef the physical signs of the condition in a paper read before the Seventh Ophthalmological Congress (1888). In their entirety these *signs* may be stated as follows:

For distance. Lateral orthophoria or slight exophoria (1°-2°) by all tests (screen, parallax and phorometer). Associated lateral movements practically normal. Associated vertical and oblique movements often restricted (frequently in an asymmetrical manner) and field of binocular single vision often* markedly limited in some one direction above or below, indicating a weakness of an elevator or depressor (particularly the superior rectus). Diverging power (abduction) not over 9°, frequently subnormal (5°-6°). Prism-convergence (so-called adduction) often, although not always, restricted. being acquired with difficulty and performed with effort.†

For near. Marked exophoria by all tests (*i. e.* exophoria of 7° or over by both phorometer and parallax, and noticeable deviation out behind the screen). Associated lateral movements normal. Pc (near point of convergence) 3″ or over from the root of the nose, and maintenance of eyes in position of extreme convergence for more than a moment difficult or impossible. Convergence near-point about the same whether the object is approximated from a point to the right or from a point to the left of the median line. If, when the convergence near-point is reached, one eye be screened and then the object of fixation is carried still closer to the nose, the uncovered eye will, although with difficulty, turn in still further, in order to follow the object, while the eye behind the screen will diverge by an equal amount (preservation of associated adduction, failure of convergence-adduction.—Graefe).

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*In about 20 per cent. of the cases that I have observed. In these cases there is often hyperphoria for distance in the primary position.

†That is, the primary adduction (*i. e* the greatest amount that the patient can be got to do at the first trial) will be only 8° or 12°, and the addition of even 1° or 2° to this will produce insuperable diplopia. Moreover, the exertion of overcoming a prism of even this amount is associated with a sense of strain, and the patient, if he does succeed in overcoming the prism for a moment, cannot hold the images together. These features constitute a marked difference from those obtaining in normal eyes which, though they may have difficulty in learning to overcome prisms base out, will do so with ease and with rapidly increasing facility after a few trials.

Graefe's test indicates that the convergence is relatively weak—weak, that is, as compared with the absolute power of the eye to move inward (associated adduction). But whether this indicates an *absolute* weakness of convergence or not depends upon whether we regard the associated adduction (ability of the eye to move inward while its neighbor moves outward) as always normally less than the convergence adduction (ability of the eye to move inward while its neighbor is also moving inward). Graefe proceeds upon the assumption that this is the case; but in many persons, whom I examined and who had apparently normal eyes, the associated adduction seemed the greater of the two. In such the fact that they responded to Graefe's test would not necessarily indicate the existence of anything abnormal.

As to its *nature*, convergence-insufficiency may be either accommodative or non-accommodative. **Non accommodative insufficiency** may be due (A) to *direct weakness of the interni, e. g.* that obtaining after a complete tenotomy of the latter, especially when the operation has been done upon faulty principles, as to relieve a divergence-insufficiency not associated with excess of convergence. This post-operative weakness, which may give rise to a very troublesome asthenopia lasting for several months, is, to be sure, not really an example of convergence-insufficiency, being really a traumatic paresis of the interni, but in its symptoms and course it so much resembles the former as to be most conveniently considered in connection with it.

Convergence-insufficiency again occurs (B) *secondarily to a divergence-excess*—this being an example of that compensatory action, already alluded to, by virtue of which a deviation, which is at first marked for one distance only, tends to become generalized so as to become apparent for all distances alike. In these cases there is at first a marked exophoria for distance accompanied by excessive diverging power (10° or over), but with only moderate exophoria for near, good converging power, and no recession of the near point of convergence. Later, the exophoria for near increases markedly (without there being necessarily any increase in the exophoria for distance), the convergence near-point recedes, and the converging power gets to be performed with more and more difficulty. From some few observations that I have made I think it likely that this sort of extension of exophoria may occur chiefly in young persons as a result of the processes of growth, which as is well known, favor the development of a divergence of the visual lines and which may abrogate a convergent strabismus or convert a case of parallelism of the visual axes into one of divergent squint.

If this explanation is correct these cases are instances of a gradually developing bilateral insufficiency of the interni, rather than a real insufficiency of convergence.

A similar explanation—viz., the gradual production of an anatomical divergence by developmental processes taking place during the period of growth—may perhaps account for the genesis of some of the cases of convergence-insufficiency not complicated with a divergence excess.

Another variety (C) of non-accommodative convergence-insufficiency appears to be directly dependent upon an *insufficiency of an elevator or depressor muscle*, and particularly of the superior rectus. This connection, in view of the assistance that these vertically acting muscles give in effecting adduction, seems not unnatural and, at all events, appears to be quite frequent. Thus in 21 successive cases occurring in my practice 6 exhibited marked insufficiency, or actual paresis of the vertical muscles, and in another series of 27 that I examined 5 at least were thus affected. In three or 4 other cases there was more or less weakness of the superior and inferior recti of both eyes, causing a concentric limitation of the field of single vision. This weakness, from its varying character, could not be regarded as due to paresis, but was (D) simply one of the evidences of the *general lack of muscular power and muscular co-ordination* that these patients presented. Such cases, therefore, appear to occur especially in neurasthenia. In the latter condition, at any rate, and in allied conditions of general enfeeblement, convergence-insufficiency is of frequent occurrence and often occasions a troublesome and intractable asthenopia which disappears only when the causal affection has been removed.

Accommodative convergence-insufficiency consists in the development of a marked divergence for near points due to non-use of the accommodation. Accommodation being usually associated with convergence, any condition which prevents the discharge of accommodative impulses will likewise tend to inhibit the convergence. Theoretically this inhibition should occur in all cases, but practically it occurs in a minority only. These cases may be classified as follows:

(a) Patients with *uncorrected myopia*. in whom there is but little necessity for using the accommodation at all.

(b) In *hypermetropes*, who having all along accustomed themselves to using their accommodation without employing a corresponding convergence acquire thereby a relative insufficiency of the latter function. which comes to light as soon as their hypermetropia is corrected.

Thus a man with a hypermetropia of 2 D. has been accustomed when looking at an object 13″ off to use an accommodation of 5 D.: but when his hypermetropia is corrected by glasses, he suddenly finds that at this distance he has to use only 3 D. of accommodation, an amount with which he has been wont to associate a much smaller degree of convergence. Not being able at first to accustom himself to these new conditions, *i. e.* not being able at once to converge to a point at 13″ without using 5 D., his visual lines diverge. This divergence often gives rise to considerable trouble (persistence of asthenopia, etc.) and constitutes one of the chief reasons why convex glasses are not tolerated by many hypermetropes.

For a similar reason convergence-insufficiency may develop (C) in *presbyopes* who first put on convex glasses for near.

The marked increase in a convergence-insufficiency generally produced by (D) the continuous use of *prisms*, base in, is also probably in part due to accommodative inaction; the use of such glasses by favoring divergence tending to relax the accommodation still more and hence to superinduce a still further failure of the convergence.

The *course* of a convergence-insufficiency varies greatly. Many cases, particularly those dependent upon general muscular and nervous weakness remain about the same for a long time and then improve as the causal condition improves. Such cases may also show recurrences, when for any reason there is a new deterioration of the vital forces. Cases also of accommodative convergence-insufficiency due to a readjustment of the optical conditions under which the patient has been working (application of convex glasses for hypermetropia and presbyopia) usually get well, the patient accustoming himself after a while to his new refractive state. This is, however, by no means always the case, and, if a tendency to convergence-insufficiency already exists, it may become aggravated and be made permanent by the use of glasses—indeed, the development of an actual strabismus divergens may be thus superinduced, particularly when the glass chosen for a hypermetropic child has been somewhat in excess of the true hypermetropia.

Convergence-insufficiency due to tenotomy also generally tends to disappear, although this again cannot be taken as the invariable rule.

Other cases of convergence-insufficiency, and particularly those occurring in young persons and dependent upon an insufficiency of the elevators and depressors, tend to increase. This seems to take place by the development of a divergence-excess in accordance with the law of compensation already several times referred to, by which a non-comitant deviation tends to become comitant. The course of such cases, if unchecked, is first increase of the exophoria for near. second development of exophoria for distance also, with increased diverging power (Divergence excess), next the appearance of an actual divergent strabismus for near with considerable exophoria for distance (Periodic squint). and finally divergent strabismus for both distance and near (Constant squint). This tendency to a constantly increasing divergence may be favored by the injudicious use of convex glasses and particularly by the use of prisms base in, which almost always tend to make the exophoria greater and greater.[*]

As has been seen, convergence-insufficiency may be *complicated* with an insufficiency of one of the vertical muscles. the latter affection, indeed, in these cases probably being the cause of the former. In other cases, a divergence-excess is present which is sometimes the cause, but more often the effect, of the convergence-insufficiency. The latter may also, particularly in those whose muscular system generally is weak. be complicated with a divergence-insufficiency.[†] Slight cases of this sort, in which the insufficiency of divergence is not great enough to produce esophoria for distance constitute the asthenic exophoria of Savage.

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[*] I observed one marked case of this sort, occurring in a girl of nine, who at first had 3° of exophoria for distance and over 6° for near, but who after using prisms for a year had for distance exophoria of 8° with abduction of 10°-12° and spontaneous crossed diplopia, and for near exophoria of 15°. Prism-convergence (adduction) 0°. By exercise of the convergence with prisms the exophoria for distance was reduced to 0°-3°, that for near to 5°-6°, the prism-convergence was raised to 40°-50°, and there was no more spontaneous diplopia. This improvement was maintained up to the

The *symptoms* of convergence-insufficiency are asthenopia, either simple, or associated with headache and pain in the eyes, conjunctival irritation, and spontaneous diplopia, producing blurring of visions for near work. Asthenopia is a pretty constant symptom, being met with in all the varieties, although in my experience more apt to occur in the non-accommodative than in the accommodative form. It is often very marked and may incapacitate the patient from doing near work.

The symptoms are by no means necessarily in direct relation with the amount of the deviation, being, in fact, more pronounced in deviation of medium degree than in those which have assumed the proportions of a regular squint.

It is for this reason, probably, that the use of concave glasses in myopes affected with convergence-insufficiency sometimes causes distress; since these glasses tend to increase the impulse to convergence and thus reduce a large deviation, which is insuperable and gives no trouble, to a smaller one which can be overcome by effort and hence gives more annoyance. On the other hand, when the deviation is very small to begin with, the symptoms may be aggravated by the use of convex glasses and of prisms base in, which tend to make it larger and therefore more troublesome.

The *treatment* of convergence-insufficiency must aim first at *removing the cause* of the trouble. Hence in neurasthenia general strengthening measures (out-of-door exercise, tonics) are indicated and are for the most part successful. Accommodative convergence-insufficiency requires the careful correction of the refraction in myopia, while in hypermetropia frequently an under-correction will be indicated. Indeed, it is a safe general rule to fully correct myopia and to under-correct hypermetropia whenever much exophoria exists; and in presbyopia under the same conditions to give a weaker convex glass than would otherwise seem indicated.

The immediate causal indication requires *training of the convergence*, which can, in general, be effected by systematic exercise with prisms base out. This often gives strikingly good results, but in some cases fails altogether.

The wearing of *prisms* base in should be resorted to only

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time that the patient was last seen (7 months after the treatment had been discontinued).

[†] I have notes of a case of this sort in a myope of 8-10 D., in whom there was an esophoria of 14-20° (i. e. a real convergent squint) for distance, with diverging power of 2-3°, and exophoria of 8° for near.

as a temporary expedient, on account of their tendency to produce increase of the trouble; and these prisms should be discontinued at once as soon as signs of such an increase begin to manifest themselves.

Finally, if an *operation* is decided upon, advancement of the interni, coupled, in case a divergence excess is present, with a tenotomy of the externi, should be made. Tenotomy of the externi alone seldom gives any lasting result.

Hyperkineses. Spasm and Excess of Convergence. Marked tonic **spasm of convergence,** so that both eyes are turned strongly inward, has been observed in hysteria.

Minor degrees of over-action of convergence (**Convergence-excess**) are of frequent occurrence. They may be either accommodative or non-accommodative in character.

The *physical signs* of a convergence-excess not complicated with a divergence-insufficiency are as follows:

For distance. Orthophoria or moderate esophoria (1°-3°) by all tests (phorometer, screen and parallax). Associated lateral movements normal. Diverging power normal or but slightly subnormal (5°-8°). Prism-convergence (adduction) normal in amount, rapidly acquired, and easy to produce and maintain. Exercise of convergence not infrequently causing the development of temporary homonymous diplopia. Homonymous diplopia sometimes also producible by will and apparently without effort.

For near. Esophoria by all tests, often exceeding that for distance.* Convergence near-point 1¼″-1″ or less.

Non-accommodative convergence-excess may be either (a) idiopathic or may (b) be secondary to a condition of divergence-insufficiency. The former appears to be rare, although I have met with two or three cases. The secondary variety, on the other hand, appears to be quite common, and develops according to the compensatory law by which deviations existing for distance and near tend to become equalized. In this case, of course, there will be marked esophoria for distance and the diverging power (abduction) will be much reduced.

Non-accommodative convergence-excess probably comprises most of the cases described by Savage under the name of sthenic esophoria.

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*Unless, however, the patient really fixes upon the test object, the esophoria for near may vary greatly and even be replaced temporarily by exophoria. This is particularly apt to be the case in accommodative convergence-excess, where the amount of hypermetropia may be such as to prevent the patient from seeing the object distinctly.

Accommodative convergence-excess (Accommodative esophoria, Accommodative convergent squint, Pseudo-esophoria) is very frequent. It occurs under the following conditions:

(a) *Uncorrected hypermetropia.* The effect of this in producing inward deviation of all degrees from a slight esophoria to a marked strabismus is too well known to require further comment here.

(b) In *myopes* who for the first time use a concave glass for near points. Such patients will add to the natural amount of convergence for the point they are looking at (which convergence they have hitherto been accustomed to make without using any accommodation) the extra convergence imposed in sympathy with the accommodative effort that they now make for the first time.

(c) In *presbyopes* (particularly, hyperopic presbyopes) at the beginning of the presbyopic period. These patients have to exert a very strong effort in order to stimulate their flagging accommodation to the point necessary for distinct vision, and in sympathy with this excessive call made upon the accommodation an excessive effort of convergence is simultaneously made.

(d) *As the result of the instillation of a mydriatic.* The increase of a convergent squint by the instillation of atropine was observed by Long and Barrett (Ophth. Hosp. Reports, xii. 1888–1889), who found that it occurred in 11 cases out of 38 in whom this mydriatic was employed. These cases, however, had been under the influence of the atropine for several days. In cases which are but recently under the influence of the mydriatic an increased tendency to convergence due to the latter appears to be even more frequent. Under these circumstances esophoria may develop where orthophoria existed before, and a pre-existing esophoria of moderate amount may develop into a well-marked convergent squint.

The correct explanation of this phenomenon was first given by Savage, although I myself came independently to the same conclusion. The convergence here is evidently due to the excessive effort which the patient makes to see distinctly under the unusual conditions presented by mydriasis. Not being aware that he cannot accommodate, he makes a violent effort to do so, and in making this effort sends out a correspondingly strong impulse for convergence. The ciliary muscle does not respond, but the interni do; and, as the impulse was excessive, they respond by producing an excessive convergence. The condition, in fact, is quite analogous to the excessive secondary deviation of the sound eye when its fellow attempts to perform fixation by means of a paralyzed muscle.

As under the mydriatic the sight is more blurred for near than for distance, this fruitless effort to see distinctly by attempting to put into motion a paralyzed accommodation will be more excessive, and hence too the esophoria will be more pronounced, for near points. For distance, the esophoria will generally be greater in proportion to the degree of hypermetropia and the consequent blurring of sight, and will often disappear altogether as soon as the refraction is corrected. These facts are shown in the following cases:

ESOPHORIA. LARGE INCREASE UNDER MYDRIATIC. Miss K., aged 20. Refraction (under homatropine) + 0.25 sph. ⊂ + 0.50 cyl. ax. V, each. When not under mydriatic shows esophoria $^3/_4$° for both distance and near (with and without correction of refraction): diverging power, 6° Under homatropine, without correction of refraction, esophoria for distance over 8°, for near over 15°, diverging power 8°. Under homatropine, with correction of refraction, esophoria for distance 5°, for near over 15°.

2. J. B., male, aged 15. Hypermetropia (homatropine) 0.50 D. Before homatropine, esophoria 3° for distance, 0° for near. Under homatropine, (with and without correction of refraction), $2^1/_2$° for distance, 7° for near. Diverging power 4°.

3. Kath. S., aged 32. Hypermetropia 2.25 D (under homatropine). Before homatropine, esophoria 2°-3° for distance, 1° for near; diverging power 5°. Under homatropine, without correction of refraction, 12°-20° for distance, 12° for near (*i. e.* has an actual convergent squint). Under homatropine and with correction of refraction, esophoria $^1/_2$° for distance: little, if any for near.

The *course* in case of convergence-excess is very variable. The accommodative variety, in particular, often decreases or disappears spontaneously either as a result of developmental changes, favoring the genesis of a divergence, or in consequence of the decrease of the hypermetropia, or because the patient gives up the accommodative effort and with it the effort to converge. Its usually speedy and total disappearance in cases coming under categories B, C, and D above given, is to be ascribed to the last mentioned cause.

In other cases, particularly in the very young who are beginning to tax their accommodation more and more with school work, the deviation increases: the regular course being, first, increase of the esophoria for near, then increase of the esophoria for distance with reduction of the diverging power (Development of divergence-insufficiency), next the development of an absolute squint for near points where accommodative effort is most required

(Periodic squint), and lastly strabismus convergens marked for both distant and near (Constant squint). A squint when thus fully developed usually remains permanently, but may disappear in latter life through the agencies mentioned in the preceding paragraph.

As already noted, convergence-excess may be *complicated* with divergence-insufficiency, the latter condition being either the cause or the effect of the former. It is also frequently complicated with some form of vertical deviation, producing hyperphoria in addition to the esophoria. It seems, in fact, not unlikely that these vertical deviations play an important part in the genesis of the excessive tendency to convergence.

The *symptoms* of convergence-excess are asthenopia. headache, and spontaneous homonymous diplopia, with sometimes more marked reflex disturbances. These symptoms, however, are much less pronounced and constant than in cases either of convergence-insufficiency or divergence-insufficiency, and when present are usually due to the attendant hypermetropia or, at least, disappear when the latter is corrected.

The *treatment* of convergence-excess is largely causal, consisting particularly in the correction of the refraction. In doing this we shall do well to follow the rule that when there is marked esophoria and, particularly, when there is more esophoria for near than for distance, we must fully correct any hypermetropia and, on the other hand, undercorrect any myopia, that may be present.

The result of treatment, both as regards the removal of the deviation and the relief of the symptoms are very good. Even in well-marked convergent squint a cure is effected much oftener than is generally supposed, the only requisites being that the refractive treatment should be kept up long enough (a year at least).* Long and Barrett (l. c.) analyzing the results in 102 cases, found that a complete cure was effected in 37, while out of 61 cases under 10 years of age 27 (or 44 per cent.) were cured.

In addition to correcting the refraction we may try to break up the excessive tendency to convergence by abolishing the accommodation altogether for a time. This we effect by keeping the eyes under *atropine* for a number of days or even several weeks. This may also, if Long and

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*This, becomes the continuous relaxation of the interni thus produced allows the weakened externi to act to greater advantage and finally to regain their tone (Long and Barrett).

Barrett's figures hold good generally, be used as a means of prognosis, for these authors found that of 5 cases which were improved by atropine all were subsequently improved by glasses, while of 6, in whom the deviation was not affected by the atropine, only 3, and of 4, in whom the atropine made the convergence worse, only 1 received any relief from the correction of their refraction.

Exercise of the divergence with *prisms* is of no service in this condition, and the wearing of prisms base out is to be deprecated as tending to perpetuate and increase the deviation instead of curing it.

If these means fail and an *operation* is thought advisable on account of the deformity or the symptoms, tenotomy of the interni may be done, combined, in case a divergence-insufficiency is present, with an advancement of the externi.

(To be continued.)

Neuro-Ophthalmic Department.

CLINICAL REPORTS OF CENTRAL LESIONS WITH EYE SYMPTOMS.

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Illustrated.

Case of Rapid Blindness, Due Probably to Hemorrhage into the Optic Nerve or Its Sheath, Followed, After an Interval of a Few Weeks, by Hæmorrhage Into the Same Side of the Brain.

Mrs. J. L. B., age 71. First seen on Nov. 16, 1895; stated that her eyes had never been strong; that she had never been able to look at an artificial light; has, nevertheless, done a great deal of reading. For some months past there has been a tendency to watering of the left eye, and some indistinctness of vision of the same eye, which varies from time to time. On use of eyes, L. becomes dim and confused "just as when she faints away." These symptoms have been more marked during the past month.

Examination showed: R. V. $^6/_{60}$ +2.25 D.
+0.75 D. 75° $^6/_9$ partly.
L. V. $^6/_{60}$ +2.25 Sph.
+ 0.5 Cyl. 70° $^6/_9$ partly.

With this eye letters have a smudgy appearance.

Ophthalmoscopic examination was difficult on account of photophobia and the small size of the pupils, but a fair view of each fundus was obtained, and nothing abnormal found. In order to determine with certainty the condition of the left fundus I directed her to return the next morning with some smoked glasses for examination under homatropine. She did not come back, however, until three days later, and then gave the following history: On the morning following her first visit the sight of the left eye was obscured, "as if looking through glass steamed or with drops of water on it," and grew worse during the day; the next morning on waking the eye was absolutely blind, and has remained so since; there has been no pain in the head or vertigo; she usually coughs on waking in the morning, but the blindness was observed before coughing.

Examination now showed that there was no perception of light; the pupil dilated and motionless; the whole central region of the retina hazy; margin of the optic disc completely obscured; faint cherry-red spot at the macula; (?) two minute hæmorrhages below the macula; the veins enlarged and moderately tortuous, being twice the diameter of the arteries, which were of normal size.

On the 20th, there was slight but definite reaction of the pupils to light thrown in obliquely, and perhaps faint perception of light.

On the 23d, the veins were noticed to be less swollen and tortuous, and on the 27th, they were practically normal in calibre.

On December 1st, the margins of the optic disc were visible, the disc itself being distinctly pale; arteries perhaps slightly diminished in size; pulsation in the veins easily produced by pressure.

The case belongs to the group of cases of sudden or rapid blindness of which embolism of the central artery of the retina is the most familiar type. The condition of the arteries, and the rapid but not sudden onset of the symptoms show that the case is not of this nature. The absence of the characteristic appearances proves equally conclusively that it is not one of thrombosis of the central vein.

It seems to me that the symptoms can best be accounted for by the occurrence of a hæmorrhage in the optic nerve just behind the point of entrance of the central artery and vein, exercising sufficient pressure only to interfere with the exit of the venous blood, but not sufficient to impair the superior force of the arterial current.

The absorption of the periphery of the blood clot would account for the rapid restoration of the veins to their normal condition.

I am indebted to Dr. W. H. Mills, the attending physician, for the following facts:

On December 23rd (in five weeks after the eye became blind), after a hearty supper, she suddenly became weak, her speech growing slow and indistinct, and in twenty minutes was unconscious. There was no cyanosis, pupils were of normal size but immobile, there was slight stertor but no convulsions. On becoming conscious, six hours later, she was unable to speak or move right arm, leg, side of face. In a few days she began to say "do" (= no) and gradually a few other words. The diagnosis made was hæmorrhage from left middle cerebral artery or from one of its branches.

She is now in moderate health, with speech still quite imperfect.

There has been no recovery of vision.

Examination of the heart showed the presence of mitral regurgitation.

The urine contained no albumen.

Hæmorrhage Into Optic Nerve, or Its Sheath, Following Repeated Retinal Hæmorrhage.

Mrs. E., aged 66, stout and plethoric in appearance; consulted me on account of recent failure of left eye, in November, 1889. The ophthalmoscope showed hæmorrhages, some striated, some soft edged, and some patches of degeneration of the retina. V. L. $^6/_{60}$. Under treatment had improved, by Jan. 18, 1890, to $^6/_{12}$ partly.

In March, 1891. Complains of distortion of objects seen by R. eye. There were some linear hemorrhages close to the optic disc; R. V. = $^6/_{12}$.

April 16. R. V. = $^6/_6$ partly, distortion much less.

June, 1891. L. V. $^6/_{24}$. There is a hæmorrhage at the upper margin of the O. D.

August 10, 1894. Since yesterday R. sees things distorted. V. $^6/_{18}$ partly. A new hæmorrhage encroaching on macula.

September 13. Distortion gone.

October. Some minute hæmorrhages in R.

On Jan. 25, 1895, she had a ride in a jolting sleigh. The same evening left eye became photophobic.

January 26. On rising eye still photophobic; V. as usual, but between 9 a. m. and 12 m. gradually failed until eye was blind.

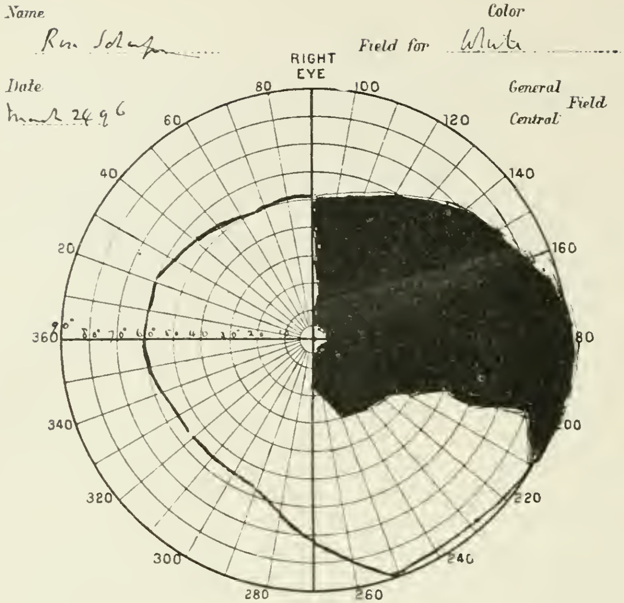
Has had some pain and discomfort in left temple lately; now some lameness or discomfort in moving eye, especially to the left.

Examination made on Jan. 30, shows pupil $5^1/_2$ mm. in diameter, motionless or very slight reaction to light. Some P. L. above and to outer part of field. Ophthalmoscope shows a small hæmorrhage up out from O. D. one disc breadth away, veins rather large and tortuous, pulsate on pressure. Arteries somewhat small, margins of O. D. visible but slightly hazy.

For reasons similar to those given in the report of the preceding case, and also because of the numerous hæmorrhages which had already occurred, this final failure was thought to be due to bleeding into the optic nerve or its sheath.

Partial Homonymous Hemianopia, with Sudden Onset, Accompanied by Transient Auditory Symptoms.

Miss R. S., aged 28, was first seen by me on March 23, 1896, when she stated that, three weeks previously, at 10 p. m., while getting ready to set bread, a noise "like a loud ringing, or a lot of bees in the ear," suddenly occurred, and a shadow came over the right eye so that she could see but very little with it, and only on the left side. There was a slight vertigo, causing her to lean against the wall for support. The vision has improved but slightly, her description of the present defect being that she cannot see on the right side with the right eye. Noise in the ears is continuous but not so loud as at



Name Rn. Schafer

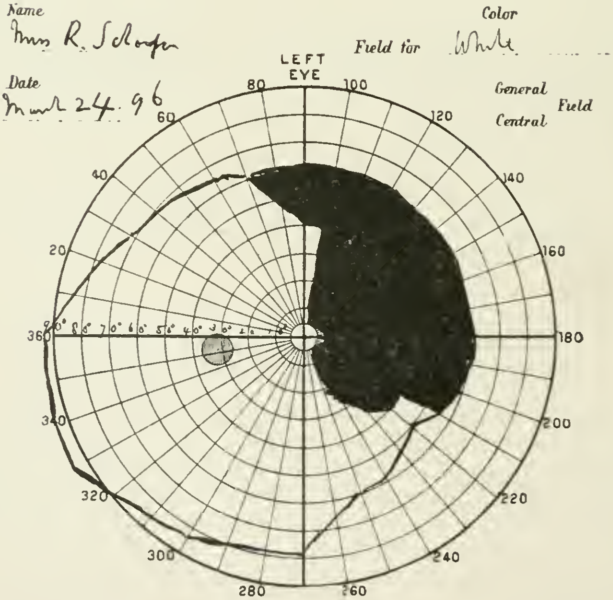
Date March 24 96

Color Field for White

Priestley Smith's Perimeter

Queen & Co.

Fig. 1.



Name Mrs R. Schafer

Date March 24. 96

Color Field for White

Priestley Smith's Perimeter

Queen & Co

Fig. 2.

first. Never had any trouble with the eyes previous to this attack. Suffered from headache and nausea for three days after this attack came on; she has been subject to attacks of dizziness for the past four or five years almost daily, but has never fallen: she described also sudden seizures which commenced with a creeping sensation at the pit of the stomach and going to the top of the head, and accompanied by everything growing black before her eyes, and by jumping or jerking of her body to the right so that she often finds herself, while walking, nearer to the curbstone than she thought she was, the whole thing being so sudden that she is surprised to find herself so near the curb stone; some drowsiness after some of the attacks; she has been subject to spells of numbness and tingling of feet and hands.

Examination: R. V. $^6/_9$ +0.5 Cyl. 100° $^6/_6$.
L. V. $^6/_6$ +0.5 Cyl. 95° improves.

Pupils react freely to light thrown in from any direction. Each eye sees bright light thrown from right upper quadrant of the field, but duller illumination is not recognized.

Examination of the field of vision with the perimeter shows total loss of the superior right quadrant in each eye, the defect extending also into the inferior quadrant leaving perhaps the inferior one-quarter of the right field intact; the dividing line between the normal and lost portion of the field is almost exactly vertical until it reaches a point five degrees above the fixation point, where it deviates to the right, leaving an area of normal vision for a space of five degrees surrounding the fixation point. The patient is anæmic in appearance but, with the exception of the symptoms already noted

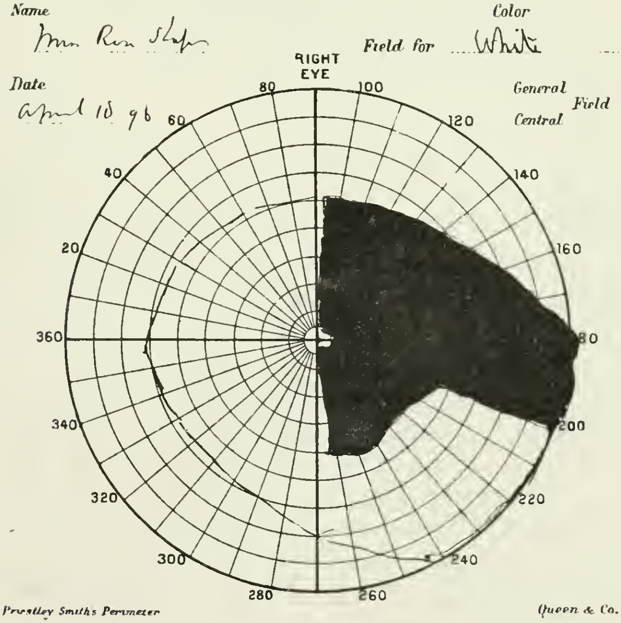


Fig. 3.

enjoys good health; the only illness from which she has suffered being an attack of malarial fever eight years ago. Testing revealed no defect of hearing, no hemianæsthesia, and no loss of power in hands. The field of vision was taken from time to time with practically the same result every time.

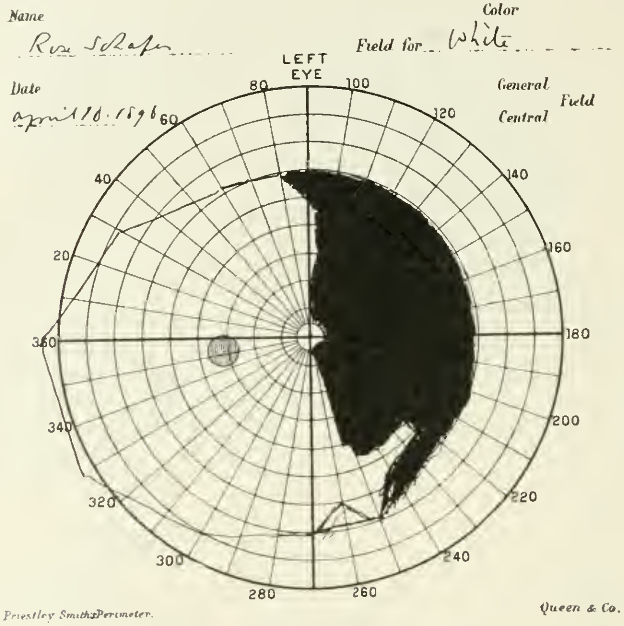


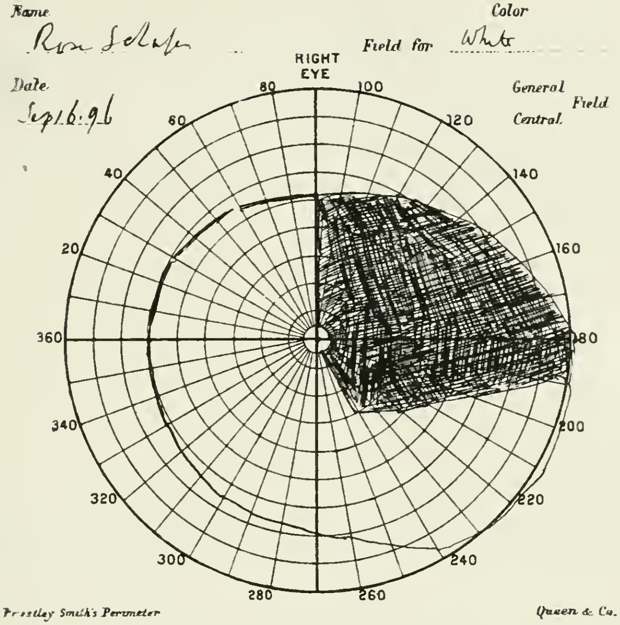
Fig. 4.

On April 28th. The noise in the ears has entirely ceased and she is having no headache, the refractive errors being corrected by glasses which are worn constantly.

On Sept. 16th. The fields of vision, measured on perimeter, are essentially unchanged. Patient states that eyes have improved, however, and testing shows that she appreciates a lower degree of illumination in the defective part of the field than she did in an earlier stage. The urine contains neither sugar nor albumen.

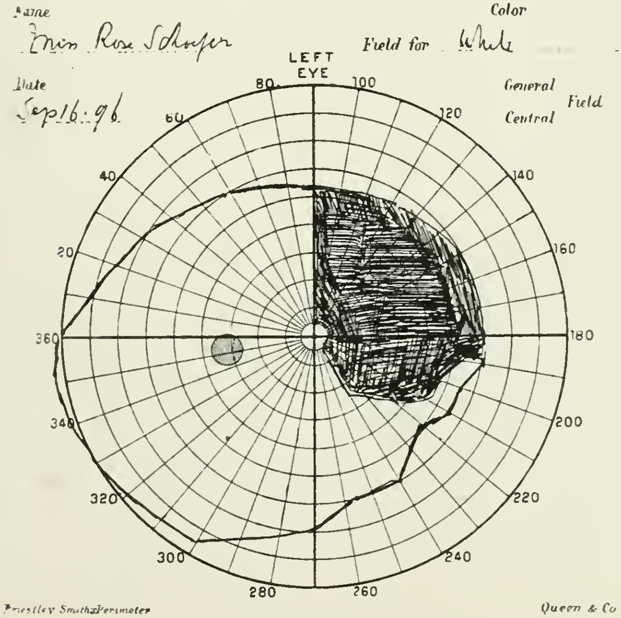
Her general health is greatly improved; there has been no return of the tinnitus. She has been taking iodide of potassium with syrup of iodide of iron.

The close association of visual and auditory symptoms at first suggested that the lesion was situated in the hinder third of the posterior limb of the internal capsule, where the visual and auditory fibres are closest together. If this were the case, however, it would necessitate the supposition of a lesion limited, with anatomical accuracy, to the fibres in question. It is unlikely that a lesion in this location would be so limited as to affect these fibres only, that



Name
Rose Schafer
Color
Field for White
Date
Sep 16. 96
General
Central
Field

Fig. 5.



Name
Miss Rose Schafer
Color
Field for White
Date
Sep 16. 96
General
Central
Field

Fig. 6.

complete recovery of the auditory portion of the lesion would occur, and no change take place in the visual portion. It seems more probable that hemorrhage or embolism took place in the visual center in the occipital lobe, and was accompanied by vaso-motor disturbance of the same hemisphere, causing transient tinnitis and vertigo. Partial hemianopia is now the only symptom of brain trouble left.

SOME BRIEF CLINICAL REPORTS.

By F. W. Marlow, M. D.,

SYRACUSE, N. Y.

Acute Rotary Nystagmus, with Slight Impairment of Lateral Conjugate Movement, Accompanied by Headache and Failure of Vision.

Mrs. M., age 44. First seen on March 10, 1896, when she gave the following history: Six weeks ago she began to have severe "clanking or piercing" pain in the top of the head and in the hollow of the neck, which lasted two weeks, toward the end of which time the vision began to get dull, "like between daylight and dark." Called a physician who gave her some medicine; it was about three days after taking it when the vision began to get dull; there was no deafness or tinnitus; at first she saw things "like animals coming up to her;" the ground now seems to come up to her; everything looks double and appears to be continually whirling, and there is a constant dull headache; for the past month she has also suffered from considerable nausea and vomiting. Previous to this there was no nystagmus or defect of vison.

Examination: R. V. $^6/_{36}$ not improved.
L. V. $^6/_{60}$ not improved.

The ophthalmoscope shows the margins of the optic disc to be obscured; the vessels all have a pale appearance as if covered with a yellow haze; some of the arteries, especially the inferior temporal of the left eye, are bordered with white lines. Groups of whitish, soft edged, irregularly round spots all over the central area; in the right eye a definite hæmorrhage near a vessel at the inner side of the optic disc; vessels are tortuous in both eyes; inspection shows well marked rotary nystagmus in both eyes, the rotation being from right to left, judging by the movement of the upper part of the cornea; there is a sudden jerk to the left and then the eye ball more slowly returns to its normal position only to be jerked again to the left. Urine sp. gr. 1015, no sugar or albumen. The patient was put on bromide and iodide of potassium.

March 17th. R. V. $^6/_{18}$ —.
L. V. $^6/_{24}$ —. Patient says the twitching of the eyes

continues during the night also: there is less headache and nausea has ceased.

March 24th. There is no nystagmus on looking down.

March 27th. Movements of both eyes to the right fuller than to the left; decided impairment of downward movement of the left eye.

May 5th. R. V. $^6/_9$.
L. V. $^6/_{24}$. Nystagmus is less marked.

May 22d. Complains of feeling numb and drowsy; when walking, limbs feel as though walking on sticks; prickling and hot flashes when sitting down; vision better but still some blur; no diplopia or whirling; no nystagmus except a little at first when looking upward to the left. The bromide was omitted from her medicine. Note on May 29th. says: "Ophthalmoscope shows, scattered over the yellow spot region of the fundus, irregular, rounded, soft edged, whitish spots, most closely aggregated at the macula; retinal vessels clearly defined over them; no hemorrhage or choroidal pigment disturbance; optic disc margins much obscured, and the whole optic disc muddy in appearance; disc in the left more obscured than in the right. The inferior temporal artery quite hidden on margin and when it emerges from the haze is bordered by white lines. There is no nystagmus except slight in extreme positions of the eye and no diplopia.

On June 26th. R. V. $^6/_{12}$ 1 letter, $\left.\begin{array}{l}-0.75 \text{ Cyl. } 15^\circ \\ +0.5 \text{ Sph.}\end{array}\right\}$ $^6/_9$ partly.
L. V. $^6/_{12}$ 1 letter, +0.75 Cyl. 90° $^6/_{12}$ better.

The history of the case as given by the patient suggested strongly that the eye symptoms were the result of medication. Inquiry of the attending physician showed that the only drugs given were digitalis and strophanthus, and Wyeth's neuralgic tablet, which would seem scarcely sufficient to account for the symptoms. The condition of the fundus suggests to some extent a gouty etiology, but no history of it could be elicited.

Taking it for granted that the visual defect is the result of morbid changes found in the fundus, the history makes it probable that these changes occurred about the time of the onset of the nystagmus. To explain the latter phenomenon the existence of another lesion at the centre for conjugate movements must be assumed. Although the suggestion does not throw any light on the primary etiology of the case, may not the headache and early symptoms have been due to a wide spread vascular disturbance of the brain, including the optic nerves and retina, which prepared the ground for the occurrence of more definite inflammatory lesions which, for reasons not obvious, became localized in the centres for conjugate movements and in the optic nerves and retina?

I have been unable to find any reference to cases of acute nystagmus in the text-books, or in the literature which is at my disposal.

Disappearance of Ptosis After Correction of Astigmatism.

Miss B., age 17. First seen in November, 1889. She consulted me on account of asthenopic symptoms, and examination showed the presence of astigmatism, corrected in the right eye by +0.25 D. Cyl. axis 90° and in the left eye by —1 D. Cyl. axis 180°, but the most noticeable thing about her was the presence of a marked ptosis of the left eye, the right being affected to a much slighter extent. This condition had existed for some years, but I am unable to state at what age it commenced.

On returning six months later, my attention was called to the fact that the drooping of the lids had disappeared (my notes say that the ptosis is almost unnoticeable with the glasses on but that without them it recurs at once in a marked degree), the change being undoubtedly quite involuntary.

Partial closure of the eye lids is a phenomenon commonly noticed in people suffering from astigmatism, and other conditions causing eye strain, but a definite ptosis, greater in the more ametropic eye, and disappearing completely and promptly on correction of the refractive error, must be a very rare phenomenon. The case is unique in my experience.

Optic Neuritis Due to Dental Irritation.

Miss N. F., age 25, referred to me, April 13, 1894, by Dr. H. L. Elsner; had been suffering for a year past from a gastric disturbance, at one time being unable to retain anything on her stomach except wafers and milk. For three or four weeks past there had been no vomiting, the general health was improved, but she was still anæmic in appearace.

History. Two weeks ago an ulcerated tooth began to ache, and a day or two later; the whole of the left side of the face became swollen. The first morning on which she had swelling of the face she noticed a severe pain in the left eye, which continued and was attributed to the tooth until six days ago when her vision became blurred, the blurring gradually increasing until the present time. Has had no previous trouble with the eyes but has had a good deal of headache in the frontal region, especially during the past two weeks, when it has been worse on the left than on the right side.

April 13, 1894. Examination of L. eye shows a slight exophthalmos; movement upward and inward causes pain in the eye; pressure backward causes pain; V. R. $^6/_9$, L. $^6/_{36}$ not improved.

The ophthalmoscope showed in L. optic neuritis with one small hemorrhage. The surface of the swollen disc could be clearly seen with + 5 D.; the fundus was otherwise emmetropic; striped condition of the retina between the optic disc and yellow spot. The right fundus was normal. The dental lesion was an alveolar abscess of the first bicuspid of the left upper jaw, which was opened and treated antiseptically by the dentist, with rapid improvement. This treatment was begun before she consulted me.

Dr. Elsner's examination of the urine showed that there was no albumen or sugar, the reaction being acid and the specific gravity 1031. There were large clusters of uric acid crystals. She was given gray powder in one grain doses three times daily.

On April 18th, V. L. $^6/_{18}$: less pain and very little tenderness on pressure; swelling of the optic disc less, 3 D. being the strongest lens with which its surface can be clearly seen; improvement continued until May 3, when vision = $^6/_{12}$ improved by +0.75 Cyl. axis 75°. $^6/_6$ partly: the outer one-half of the optic disc is quite clear; the whole disc can be best seen without any convex lens behind the mirror.

Cases of Conical Cornea with High Degrees of Regular Astigmatism.

Case 1. Miss E. G. S., age 33, referred to me by Dr. A. D. Stewart, of Port Byron, N. Y., for some years past the subject of conical cornea in both eyes; came under observation in 1893. The left eye had been operated upon by cauterization of the apex of the cone during the previous year at the Manhattan Eye and Ear Hospital without, however, any material improvement in vision but leaving a tendency to attacks of pain, scraping sensation and congestion.

Examination showed, in the left cornea a circular, flat scar
— 24° Sph. giving V = $^6/_{60}$. At her first visit I was unable to improve the vision of R. beyond $^6/_{60}$ with — 26 D., and without any glasses she could read slowly No. 1 J at $1^1/_2$ inches from the cornea.

Some months later I saw her again, and, after many tests, found that a strong convex cylinder at about 155° added to a — 18 D. Sph. gave some improvement. The cylinder was gradually increased in strength until the highest acuteness of vision was reached.

The final combination $\left\{\begin{array}{l} -17\text{ D. Cyl. axis }65^\circ \\ +\ 1\text{ D. Sph.}\end{array}\right.$ gave V. $^6/_{18}$ every letter except V, which was called Y, and with $\left\{\begin{array}{l} -17\text{ D. Cyl. axis }65^\circ \\ +3\text{ D. Sph.}\end{array}\right.$ She read No. 1 J at six inches and No. 10 J at fifteen inches. The latter combination was prescribed for general use.

January, 1894. The attacks of pain in the left eye still occur, but are relieved by the use of pilocarpine prescribed at a former visit.

She now complains of being unable to read well with the glasses, and of some aching.

R $\left\{\begin{array}{l} +3\text{ D. Sph.} \\ -19\text{ Cyl.}\end{array}\right.$ and a stenopaic slit reads 1 J at seven inches easily, and this combination was ordered. When I heard of her last she was wearing it with satisfaction.

Case 2. Mrs. J. A. W., age 30. Dates the defect in vision from an attack of measles eight years ago. She has worn glasses but has been unable to obtain any that were satisfactory. The ophthalmometer showed seven or eight dioptres of astigmatism in the right eye, the images being very irregular, and six or seven degrees in the left, the axes being at 135° and 45°.

V. R. 6.60 $\left\{\begin{array}{l} -8\text{ or }9\text{ Cyl. }45^\circ = {}^6/_{18}. \\ +3\text{ or }4\text{ Sph.}\end{array}\right.$

V. L. 6.60 $\left\{\begin{array}{l} -6\text{ D. Cyl. axis }135^\circ = {}^6/_{12}\text{ partly.} \\ -2.5\text{ D. Sph.}\end{array}\right.$ glasses fully correcting the refractive errors were prescribed and have been worn with satisfaction since, over two years having elapsed.

CASE 3. Miss M. W., age 28. The history of the onset of the defect very indefinite: glasses were prescribed for her four years ago, with which she got on well until five months ago, when she had a sudden pain in the right eye: since then any unusual eye work causes a return of the pain. She was wearing on each eye $\left\{\begin{array}{l}+ 8 \text{ D. Cyl.}\\ - 5 \text{ D. Sph.}\end{array}\right.$ After repeated examinations the highest degree of visual acuteness was obtained in R. by $\left\{\begin{array}{l}- 13 \text{ D. Cyl.}\\ + \ 6 \text{ D. Sph.}\end{array}\right.$ at 150°, which gave V. $^6/_{18}$ partly, and in L. by $\left\{\begin{array}{l}- 13 \text{ D. Cyl.}\\ + \ 6 \text{ D. Sph.}\end{array}\right.$ at 150°, which gave V. $= {}^6/_{12}$. With her glasses she could read No. 1 J with a far point of $11^1/_2$ inches. I believe she still uses the same glasses.

CASE 4. Mrs. L. H., aged 29. Seen first on Oct. 25, 1894, when she gave a history of defective vision of some years duration. The ophthalmometer showed astigmatism of about 12 D. in the right and 6 D. in the left eye.

$$\text{R. V. } {}^6/_0 \left.\begin{array}{l}+9 \text{ D. Cyl. } 165^\circ\\ -6 \text{ D. Spl.}\end{array}\right\} = {}^6/_{24} \text{ partly.}$$

$$\text{L. V. } {}^6/_0 \left.\begin{array}{l}+3.5 \text{ D. Cyl. } 175^\circ\\ - 2. \text{ D. Sph.}\end{array}\right\} {}^6/_{18} +$$

Glasses slightly weaker than these were prescribed, and as she has worn them with satisfaction until within six months.

$$\text{Sept. 9. 1896.} \quad \text{R. with } \left.\begin{array}{l}+ 8 \text{ D. Cyl. } 165^\circ\\ - 4 \text{ D. Sph.}\end{array}\right\} {}^6/_{36} \text{ partly.}$$

$$\text{L. with } \left.\begin{array}{l}+ 6 \text{ or } 6.5 \text{ D. Cyl. } 175^\circ\\ - 2.75 \text{ Sph.}\end{array}\right\} {}^6/_{24} +$$

A CASE OF TUMOR OF THE OBLONGATA.

BY HENRY S. UPSON, M. D.,

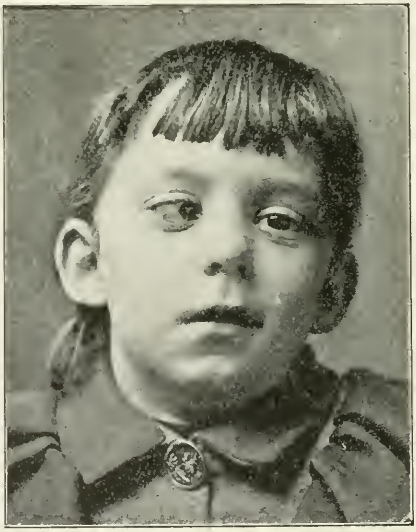
CLEVELAND, O.

MEMBER OF THE AMERICAN NEUROLOGICAL ASSOCIATION; PROFESSOR
OF NEUROLOGY IN THE WESTERN RESERVE MEDICAL
SCHOOL, CLEVELAND.

Illustrated.

The importance of the ophthalmoscope, not only in neurology but in general medicine, has been much emphasized. This does not measure, however, the necessity of care in the examination of the eye in its other relations, illustrated in some of its features in the following case:

The patient, J. A. R., a girl of seven, was quite well until she was three years old. Then she began to have convulsions, consisting of loss of consciousness, frothing at the mouth and general rigidity, but the parents remember no clonic spasms. She had five or six of these attacks in all; they then ceased and have not returned. Several months ago she began to turn her head when she looked at anything, and the parents noticed that there was strabismus. The



eye soon after this began, apparently, to protrude, and this appearance is now very marked. Within a month after the onset she began to lose power in her left hand, later in her left leg. She has had no convulsions for the last three years. The child is still intelligent but not as bright as she was formerly. Her appetite is good but bowels somewhat constipated. She has had little, if any, headache. On examination the patient is moderately nourished, somewhat apathetic-looking and keeps her mouth open. The right eye cannot be closed; it is turned in and cannot be turned at all to the right. The facial muscles of the right side show a marked loss of power. This is chiefly seen when she smiles, which it is rather difficult to get her to do. Her left arm can be raised at the shoulder and bent a little at the elbow, but there is entire loss of power in the fingers and hand. The feet cannot be moved at all, but the leg can be bent at the knee rather feebly. Walking is quite impossible. There is sensibility to tactile and painful impressions in both arm and leg. The knee, wrist and elbow-jerks are lively on the right side, exaggerated on the left. There is no ankle-clonus. The muscles of the face and limbs of the left, as well as of the right side, react well to the Faradic current. The tongue is protruded fairly straight. There is no tenderness on percussion over the skull. The pulse is soft, regular, 112. A watch is heard at two feet on the right side and at one foot on the left. Dr. Bruner kindly examined the eyes and made the following report:

"The examination of the eyes shows paralysis of the orbicularis of the right eye. The right palpebral fissure is decidedly wider than the left, which is six millimetres, while the right is ten millimetres, and remains the same whether she opens the eyes as widely or attempts to close them as tightly as possible. Her lower lid droops, exposing the sclera, and there is very frequent lachrymation. At first glance the eye appears to protrude considerably, but closer examination shows that this appearance is due to the paralysis of the orbicularis. There is also complete paralysis of the external rectus of the same eye so that the inner edge of the cornea comes in contact with the internal canthus as the patient looks directly in front of her with the left eye, and she is unable to turn the eye outward as far as the median line. The eye moves readily in all other directions. The movements of the left eye are good in all directions. The pupils are equal and respond promptly to light and in accommodation. The form-fields are apparently normal so far as we could tell with the little patient in her apathetic condition. Vision could not be definitely ascertained, but apparently is not affected.

The ophthalmoscope shows in the right eye the media clear, disc round, physiologic cup narrow, scleral crescent out, vessels normal in size and distribution, the nerve is normal in color and the retina and choroid in good condition; in short, the fundus presents nothing of any pathologic significance. The fundus of the left eye is the same except for the absence of the scleral crescent and the presence of a small cilio-retinal vessel."

The patient was next seen Dec. 10, 1896. Her condition is very much changed. She has lost flesh and is unable to sit up. Her head hangs heavily and she does not raise it. The chin is dropped and she has a good deal of difficulty in swallowing and cannot chew her food at all. She does not smile and seems to have lost power on the left side of the face as well as on the right. The left palpebral slit is wider than before although not so wide as is the right one. The right eye is in the same position as before. Marked optic neuritis has developed in both eyes but without hemorrhage. The patient is apathetic but suffers no pain. She recognizes the people about her readily.

It is unfortunate that the preceding case could not be examined more thoroughly with especial reference to anesthesias, narrowing of the field of vision, and so on, which her age and lack of intelligence rendered out of the question. One main interest in the case lay in the difficulty in making out early the paralysis of the right side of the face. A bulging of the right eye was so closely simulated by paresis of the orbicularis and the external rectus as to make a quite careful examination necessary. The fact is striking that with the very marked symptoms of tumor at the base of the brain, on the first examination no trace of optic neuritis could be found. Its rapid development later was coincident with an appalling increase of the paralytic symptoms. The increasing weakness of the neck and trunk-muscles and beginning loss of power on the left side of the face, with much more marked speech defect, point to an early termination of the case, which unfortunately cannot be averted or even delayed.

The location of the tumor is evident. It is on the right side of the oblongata, involving the nucleus of the right facial nerve, and the pyramidal fibres before their crossing, as they descend to the left side of the body.

As to the nature of the tumor, its present rapidity of development points to the probability of its being a glioma. There is absolutely no specific history in the case, no consumption in the family, and the other children, of whom there are five, as well as the father and mother, are all healthy.

THE EYE IN HEREDITARY ATAXIA WITH A REPORT OF FOUR CASES OF FRIEDREICH'S ATAXIA IN ONE FAMILY.

By Charles W. Burr, M. D.,

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OF THE MIND AND NERVOUS SYSTEM IN THE
PHILADELPHIA POLICLINIC.

The mother of the patients is a strong, healthy looking woman, 67 years old. The father, who is reported to have been a temperate, hard-working man, was drowned while at work. No relation has had any disease characterized by difficulty in walking or speaking. Neither the mother nor the children show any signs of, or give a history pointing toward, syphilitic infection. There have been nine children, of whom four died in infancy, one is a healthy male adult, and the remaining four are included in this report. The examinations of the eyes were made by my friend, Dr. M. W. Zimmerman, Ophthalmologist to the Germantown Hospital.

Case 1. Julia, 24 years old, came to Dr. Morris J. Lewis' clinic at the Infirmary for Nervous Diseases in May, 1892. According to her account, she was healthy until about the seventh year. At that time her mother noticed that she walked awkwardly and occasionally tripped. Her condition slowly grew worse, and a few years later speech became affected. She never had lancinating or other pain, but there was at one time some numbness of the feet. It was impossible in this case and, indeed, in the succeeding ones also, to get any clear account of the progress of the disease or the dates at which the symptoms appeared.

Present condition. The gait is markedly staggering. So great is the sway that she can scarcely stand with the feet not widely apart. If they are brought close together she falls. The sway is not made worse by closing the eyes. While sitting, there are constant, gentle, wave-like movements of the head, trunk and arms. There is great difficulty in touching the nose or ear with the finger, and on attempting to pick up an object the "hovering hand" is well shown. There is no palsy. The knee jerk and biceps tendon jerk are absent and not reinforcible, but the chin jerk is very marked. Touch and pain sense are normal in the arms and legs. There is no muscular atrophy. A slightly elevated, broad, bright red band appears in the wake of a pin drawn lightly over the skin on any part of the body. Intelligence is good and disposition amiable. Speech is slow and drawling, not scanning. There is very slight lateral spinal curvature. The urine contains neither albumen nor sugar.

Eye examination. "No ptosis or other extra-ocular paralysis. Movement of the eye balls good in all directions. Convergent strabismus of moderate degree, alternating. No nystagmus on approaching near point but appears during extreme lateral fixation, is fairly regular, and consists of a small horizontal excursion. Fixation is at all times unsteady but does not constitute true nystagmus except under the above conditions. There is slight pallor of the discs, otherwise the fundi are normal. The pupils respond promptly to light but sluggishly and irregularly with accommodation. V. O. D. $^1/_3$, O. S. $^1/_5$. Ophthalmoscope shows H. 1. D."

CASE 2. Frank, aged 34 years. "Nervous fever" when six years old. Immediately after his mother noticed involuntary movements in his hands and awkwardness in gait. Has at times complained of slight rheumatic pains in the legs. The disease has slowly but steadily progressed.

Present condition. Sits huddled in a chair, the back bent forward and to one side, the legs sprawling. There is some static ataxia. On attempting to stand, wild ataxic movements appear. There is no true palsy. The knee jerk, biceps tendon jerk, and cremasteric reflex are absent and not reinforcible. The chin jerk is very marked. Both feet are characteristically clubbed. There is slight lateral spinal curvature. The legs are purplish and cold. There is some general wasting of the extremities, which present a great contrast to the thick, bull-like neck and heavy face. As the patient has not walked for many years, the wasting is probably largely, if not entirely, due to disuse. Speech is slow, hesitating, drawling, and often can not be understood. Touch and pain sense are normal and the patient localizes well The sense of the position of the extremities while the eyes are shut is good. Measured by ordinary standards his mental power is low, but when we remember that he is absolutely without education, that his speech is sadly affected, that his family have lived almost without human intercourse, is foreign, and has in the course of years developed, one could say without exaggeration, a hybrid language of its own, we are justified in believing that his mental weakness is in truth only apparent and due to external causes. The urine contains neither albumen nor sugar.

Eye examination. "No extra-ocular paralysis. Movement of the eye balls fair in all directions. There is a very high degree of divergence, always fixing with the right eye. Very slight nystagmus when eyes are at rest or covered, appears with fixation, increased on approaching fixation point and very slightly increased on extreme lateral position and only in the fixing eye. Pupils respond very promptly to light, with accommodation doubtful and irregular, at times seems to be smaller for distance. This case and Charles show during accommodation distinct ataxic movements of the pupils. Good view of the fundus not obtainable, but no grave lesion was noted. Ophthalmoscope shows myopia 2–3 D. Vision could not be taken, but it is alleged to be good.

Case 3. Charles, aged 30 years. Present trouble began in the seventh year, the first symptoms noted being awkwardness.

Present condition. Motor ataxia is so great that he cannot walk or even get upon his feet. There is quite marked static ataxia. The knee jerk and biceps tendon jerk are absent and not reinforcible. The chin jerk is marked. There are occasional fibrillary twitchings in the deltoids and great pectorals. The thenar and hypothenar eminences and the interossie muscles are much wasted. There is decided palsy in the wasted parts and some general weakness in all the extremities. Speech is slow and hesitating. The mental state is similar to that found in Frank. There is rather marked lateral curvature. Both feet are clubbed. Touch and pain sense are normal. The patient localizes touch well. Sense of position of the extremities is good. A slightly elevated, broad, red line follows a pin drawn lightly over the skin. The urine contains neither albumen nor sugar.

Eye examination. "No extra-ocular paralysis. Movement of the eye balls good in all directions. Marked alternating divergent strabismus. Very slight horizontal nystagmus at all times, increased by fixation and by approaching fixation point, and worst during extreme lateral fixation. The pupils respond to light promptly but very sluggishly and irregularly with accommodation, at times failing to contract at all. It is very difficult to obtain a good view of the fundus, but both nerves are probably normal. Vision is said to be fair, but it could not be estimated with any certainty, fixation being extremely difficult."

Case 4. Mary. Onset when about 17 years old. First symptoms noticed, stumbling gait.

Present condition. Gait quite ataxic. Sways badly when standing, whether the eyes are opened or closed. When sitting there are quite marked waving movement of the body and extremities. The "hovering hand" is well shown when she attempts to pick up an object. The knee jerk and biceps tendon jerk are absent and not reinforcible. The muscle jerk is very marked in the arms. The chin jerk is very active. Speech is slow, hesitating, drawling. The mental condition is excellent. Touch and pain sense are normal. She localizes on touch well. Sense of position of the extremities is good. There are no paralyses. Club-foot is absent. The urine contains neither albumen nor sugar. There was no opportunity to examine her eyes.

In all of the cases, examination of the abdominal and thoracic organs gave negative results. In none was there palsy of the bladder or rectum. The diagnosis of Friedreich's ataxia is based on the following: The affection of four members of the family, the ataxia, the absence of the knee jerk, the characteristic speech, the entire absence of sensory symptoms and the presence of nystagmus. In the third case the lesion must have extended beyond the postero-lateral columns to the anterior gray matter or there would not have been the marked local muscular wasting. Chin jerk, so far as I am aware, has never before been noticed in Friedreich's ataxia. It is curious that, with the other deep reflexes absent, it should be not only present but very marked. Its significance I do not know unless it marks a step in the upward progress of the lesion.

Examination of the eyes of ataxic children is of value as an aid in determining whether any given case is one of Friedreich's ataxia, of the family form of cerebellar ataxia, of the very rare locomotor ataxia, beginning in early life, or of cerebellar tumor.

The most frequent eye symptom in Friedreich's ataxia is nystagmus. In Griffith's carefully studied series of one hundred and forty-three cases it was present in fifty-six, absent in forty-six, and not mentioned in the remainder. In later tables the percentages remain the same. It usually appears at or about the same time as the affection of speech but may not appear until many years later. On the other hand it very rarely is seen very early in the course of the disease, as in a case of Erlenmeyer's, in which it appeared at the outset of the disease, lasted three weeks and then disappeared permantly. It most frequently is ataxic in type, that is to say, there is horizontal, bilateral oscillation of the balls, appearing only on fixation, most marked or present only when the patient looks to one side, and ceasing when the eyes are at rest. Static nystagmus, that is, nystagmus of the resting eye, is very rare. The pupillary condition varies. The pupils are in some cases dilated, in others contracted, and the movements are sometimes sluggish. In none of Griffith's cases were they found not to react to light and on accommodation. Several cases have, however, been reported in which the light reflex was lost, and, according to Gowers, whenever this condition exists, evidence of hereditary syphilis should be sought for, since it is probable that many of the cases in which this loss was met with were cases of true tabes occurring in young people. In our cases response to light was prompt but with accommodation sluggish or absent.

Marked optic atrophy never occurs. Powers records white discus in one case and Seguin partial atrophy in another. The cases of Friedenreich and Rouffin'et seem to more properly belong in the class of cerebellar ataxia. Sinkler and Oliver have found changes in the nerve head similar to those seen in the earlier stages of locomotor ataxia, and de Schweinitz has had a similar experience in one or two examinations.

Strabismus, blepharospasm, diplopia and ptosis sometimes are met with, but are complications rather than a part of the symptomatology of the disease.

In the cerebellar type of hereditary ataxia the eye symptoms are much more marked than in Friedreich's ataxia. As in the latter nystagmus is very frequent, but, more than this, optic atrophy with contraction of the fields of vision, or amblyopia, is a common symptom. The pupil may fail to respond to light or to contract with accommodation. Sometimes there is diplopia, sometimes color-blindess. Apart from the eyes, the symptoms of the two types differ widely. The cerebellar variety begins at or soon after puberty, the knee jerks, instead of being absent, are exaggerated or at least well marked; there are distinct sensory disturbances, and the special form of club-foot and the spinal curvature seen in Friedreich's ataxia are never present.

ABSTRACTS FROM CURRENT AMERICAN AND ENGLISH OPHTHALMOLOGICAL LITERATURE.

By Charles H. May, M. D.,

NEW YORK.

A Discussion on the Operative Treatment of High Myopia.

By J. B. Lawford, F. R. C. S.; F. R. Cross, F. R. C. S.: Dr. Argyll Robertson. Dr. P. W. Maxwell, and Rainer Batten. Report of the '96 meeting of the British Medical Association. *British Medical Journal*. Sept. 12, 1896.

Mr. Lawford opened the discussion by pointing out that the subject was one of great and probably increasing importance. but by no means simple, and that we are in need of more accurate information in regard to several particulars. He assumed that it was unnecessary to argue whether or no this treatment were justifiable—its claim as a recognized surgical procedure had been established.

"For convenience I have arranged, and shall endeavor to introduce the matter for discussion under several headings. . . . those on which discussion is most expedient or likely to prove most instructive. Referring for a moment to the published records (according to Fukala there are about 1,000 cases on record), I may point out that this treatment has been adopted and carried out most extensively in Germany and Austria. and to a less extent in France, Belgium and Switzerland. It is. considering the prevalence of myopia in the two first named countries. easy to understand that the opportunity, perhaps I should say the necessity, for operating must arise much more frequently there than in our own land. In English literature there are, so far as I know, few recorded cases.

1. THE DEGREES OF MYOPIA.

It is, I think, impossible to make any very definite statement in reference to this point. A decision can only be arrived at after consideration of other conditions besides the actual number of dioptres of myopia: such conditions are the age and health of the patient, the character of the myopia, whether progressive or stationary, and any complications which may exist, for example, disease of the vitreous, or opacity of cornea. The social surroundings and duties of the individual may also have to be taken into account.

Another, but important question, is to what extent for practical purposes, that is for school or wage-earning work, vision can be made serviceable by means of glasses. The lowest degree of myopia to which this operation is applicable differs somewhat in the opinion of different writers. Generally speaking, eyes with less than 11 or 12 D. are not suitable. Some writers have given 13 D. as the starting point, others 15 D. There is probably no upward limit. The highest degree recorded was in one of Schweigger's patients, in whom myopia of 33 D. was present.

The knowledge, comparatively recently gained, and which has still more recently become general, that the alteration in the refraction resulting from removal of the lens is very different in myopia to that in emmetropia, must to a certain extent influence us in deciding for or against operation. The lowering of the refraction has in most cases been from 16 to 18 D. It would appear (Stadfeld) that the greater the degree of myopia the greater the change in refraction resulting from removal of the lens; an eye with myopia of 7 D. will become hypermetropic to the extent of 6.6 D. (alteration of 13.6 D.); a myopia of 19 D. becomes converted into hypermetropia of 10.2 D. In the case of 33 D. of myopia referred to above, the refraction after removal of the lens was 13 D., a difference of 20 D.

In some of the recently published cases (Vacher) in which a comparatively low degree of myopia was present, and consequently the refraction after operation was hypermetropic to a varying degree, up to 3.5 D., the improvement in visual acuity, and, according to the authors, in the visual capability of the patients, was very marked—that is, the individual was very much better off for all ordinary occupations, wearing with comfort + 1 D. to +3.5 D., than when using or endeavoring to use —12 D. to —14 D., and complaining constantly of discomfort and inability to pursue his or her avocation.

Closely connected with the degree of myopia, and best discussed in association with it, are other conditions dependent upon the elongation of the eyeball: these are, *inter alia*, inflammatory and atrophic changes in the choroid revealed by the ophthalmoscope, opacities in, and loss of consistence of, the vitreous.

The existence of choroidal atrophy in the form of the common posterior staphyloma, even when of considerable extent, would seem, from the writings of several surgeons, not to be a very serious complication, and has not deterred them from operating.

It is, I think. important to determine as far as possible whether the choroidal changes are stationary. Their extent and degree must also be carefully considered. No one would decide to operate in a case in which the choroid was destroyed over the whole of the macular region.

Fukala states that he does not consider an eye suitable for operation unless visual acuity (with correction) is = $\frac{1}{10}$. and the eye could read 1 J., or at least 2 J., well. He is not followed in this opinion by some other writers.

2. THE AGE AT WHICH THE OPERATION MAY BE UNDERTAKEN.

The surgeons who first systematically practiced this operation (Fukala. Vacher, and others) performed it only upon young patients in whom the lens could be treated by discission and subsequent evacuation. But in the last two or three years, this treatment (that is. removal of lens) has been extended to adults and those beyond middle age. At the Heidelberg Congress of 1895, v. Hippel and Sattler reported cases in patients up to 64 years of age with satisfactory results. Vacher, Pflüger, Schweigger and others, have also operated with success on patients of from 35 to 50 years of age.

I cannot from experience offer any opinion as to the advisability of removing the transparent lens in middle-aged patients. My few cases have been children. My feeling is, however, in favor of restricting the operation generally to young eyes, although I have no wish to oppose its performance in older patients in suitable cases.

It has been stated (Sattler, v. Hippel)—and this is an important observation if correct—that the lens in highly myopic eyes does not undergo sclerosis in the way that it does in emmetropic and hypermetropic eyes. It is obvious that if this is so, it may. or rather must. have an important bearing on the method of dealing with the lens.

There can be, I think, no serious objection to operating in early childhood if the degree of myopia is sufficiently high; indeed my feeling is that the conditions are likely to become less favorable if operation is postponed.

3. TECHNIQUE.

The general opinion of writers is decidedly in favor of discission of the lens, and subsequent removal of opaque fragments. Fukala, in his most recent communication on the subject says, "That direct extraction of the transparent lens is not the right method has been abundantly shown." On the other hand, Vacher, in a paper read before the French Ophthalmological Society a few weeks ago, recommends the operation of extraction, and reports a second series of 14 cases with good results. The author first referred to counsels a very free needling of the lens; this should be repeated once or twice, and the broken up lens subsequently evacuated.

I have hitherto employed discission of the lens, repeated if necessary after an interval of a few weeks, and subsequent removal of the swollen lens through a small corneal incision, either by "curette evacuation" or by means of a Bowman's lens syringe. Unless the patient can be kept under constant or very frequent observation, it is, I think, better to needle freely, and remove a portion of lens matter a few days later. There is then little or no risk of secondary glaucoma, and absorption of the remaining lens substance can be allowed to go on slowly and safely.

Iridectomy, as a step in the operation, seems to have been abandoned. In the treatment by discission and evacuation, it can, I imagine, be seldom necessary. If direct extraction is practiced, iridectomy may be expedient, but we must bear in mind that in these highly myopic eyes the value of a circular active pupil is even greater than in the case of ordinary senile cataract.

It is, I think, unnecessary to introduce as a matter for discussion the necessity, in this operative procedure, of the most careful precautions against sepsis. If time permitted it would be perhaps interesting to say something of the methods employed, and subsequent speakers may wish to ventilate this subject. I must, however, pass it by in the assurance that we are unanimously of opinion that every care should be taken to ensure freedom from septic infection.

4. RESULTS OF THIS METHOD OF TREATMENT—(a) AS TO REFRACTION AND VISUAL ACUITY; (b) AS TO THE FUTURE OF THE EYES OPERATED UPON.

(a) I have already briefly referred to the alteration in the refraction of the eye; unless the operation is performed on eyes with myopia of less than 10 or 11 D., the alteration cannot but be a beneficial one. The result as regards visual acuity and visual capability appears from published records to be most satisfactory. In the majority of published cases visual acuity has been increased twofold, threefold, and sometimes more, and in the cases in which the visual acuity has remained unaltered, the capabilities of the eye have been very noticeably augmented; patients who before operation could only see distant objects distinctly by the aid of a strong concave lens which could not be tolerated for long, after operation can see clearly either without assistance or by the help of a glass of medium strength (+ or —), which they can wear comfortably and constantly.

For the wage-earning portion of the community the acquisition of good, or even moderate, distant vision is an enormous advantage, and may make all the difference between ability of the individual to support himself or herself, and being rate-supported. In the case of such people, it is a great gain to have sight sufficiently improved, but it is also a very important help to them if they can see to do their daily work without glasses. A laborer who has $V. = \frac{6}{18}$ without glasses, will be far more likely (in this country, at least) to obtain work than one who can see $\frac{6}{12}$ or even $\frac{6}{6}$ with glasses.

Another point gained for these myopes is an increased range of vision for reading and other near work. The highly myopic person must either read without glasses, having the book inconveniently close to his eyes, and often sacrificing binocular vision because he cannot maintain sufficient convergence, or he must increase his reading distance by glasses which necessarily reduce considerably the size of the retinal images, and thereby render reading difficult and tiring.

According to the writings of many (Thier, Pergens, and others), removal of the crystalline lens very materially benefits patients in this respect; the use of a weak concave or convex glass subsequently enables them to carry on near work which they had previously been obliged to relinquish. The loss of the power of accommodation, which was thought by Donders to be a serious objection to this treatment of myopia, has proved to be no objection at all. The range of distinct vision for reading is greater and infinitely more useful in these highly myopic eyes, after removal of the crystalline lens, than that which they previously possessed by reason of their power of accommodation.

Why is the improvement of vision after removal of the lens so great? Without discussing this question at any great length, or entering into any abstruse calculations, some reasons may be given. In the first place, the retinal images are much larger; Fukala says they are about twice as large; then the central part of the retina receives more light rays, and is better illuminated (Rhanz), and also there is less dispersion of rays after entering the eye, partly because of the absence of the concave spectacle lens and partly because there is only one refracting surface, that of the cornea, as against five in the corrected myopia eye.

(b) Is an aphakic myopic eye more durable than one retaining its lens? Is it more or less liable to such accidents as detachment of the retina? Does elongation of the globe continue in aphakic eyes?

The first question cannot be positively answered at present; several writers who have watched their cases for a few years, report that the eyes show no signs of giving out. Detatchment of the retina, at a varying interval after operation has been recorded in a few instance. Sattler met with four instances in 68 cases; in two of these there was escape of vitreous at the time of the operation; in one the detachment followed a blow with a fist.

Similar cases have been reported by Fukala and others; but of the large number of eyes which have been operated upon, a very small proportion seem to have suffered from detachment of retina. Cases have been recorded in which detachment has occurred in the non-operated eye, and more than one surgeon has ventured to remove the lens from one eye of the patient in whom the fellow eye was blind from detatchment of the retina. One writer, Vacher, maintains that removal of the lens is a preventive measure against detachment of the retina.

Concerning the question of arrest the myopia by this operation, the evidence seems as yet too contradictory to be of much value; the instances given which bear upon this point are few, and the period during which they have been under observation too brief to enable us to place much reliance upon them. Eperon states that in many instances there is not only no further elongation of the globe, but an actual shortening, after removal of the lens; this applies to eyes with all varieties of refraction. He is supported in this view by Vacher and Pflüger. Fukala mentions two cases in which he was able to determine this point; in one there was partial arrest, in the other complete arrest of the mypoia. von Hippel says that he could find no increase of myopia during two years in his cases.

In relation to this questien several of the reported observations have been made by comparing the condition and alteration of the operated and non-operated eye of the same patient. Uhthoff mentioned a case in point at the Heidelberg Congress last year. Nine years before he had operated on a very myopic patient for perinuclear cataract. Since that date the myopia has slowly increased at the same rate as it had done before operation.

Mr. Cross continued the discussion. He gave a table of 1774 cases of myopia taken from his private case-books, giving the degree of myopia and the corrected visual acuity. "As myopia increases in degree there appears to follow a slight diminution in the best attainable acuteness of vision. This is especially evident in the higher degrees over 10 D. The inability depends partly upon complications, particularly in the choroid, partly upon amblyopia, and largely upon the aberration of light associated with a strong spectacle lens." . . . . "High myopia we regard as a strong predisposing cause of detached retina, but its influence may have been overstated. . . . . "I believe that detached retina, which may follow degeneration of retina, vitreous, or choroid, is largely a senile disease.

Age of 36 Cases with Detached Retina.
In 8 cases over 70 years.
In 9 " " 60 "
In 5 " " 50 "
In 5 " " 40 "
In 5 " " 30 "
In 5 younger than 30 years.

These figures are accurate so far as they go: more detail when they were made would have rendered them of greater value.

Detachmant of the retina would seem to be not less likely to follow removal of the lens from old eyes (for example, in senile cataract) than from young or middle-aged eyes affected vith high myopia. Clinical experience entitles us to disregard the danger in the first case, and we are justified in assuming that it may not be very pressing in the other.

The proposal to treat very high myopias by removal of the lens was made in 1858 by Mooren, but it was opposed by Graefe and Donders. Fukala in 1890 published a paper on the subject, and gave a great impulse to operative interference for high myopia. Since then a large number of operations have been done on the Continent, and by Fergus and others in this country, with satisfactory results, and apparently with few failures—two or three from detachment of the retina or vitreous degeneration.

In nearly all the cases there has been an improvement in the far sight, and an increase in the distance at which reading and other near work is possible. Schanz (Dresden) attributes the improvement:

1. To increase in the size of the retinal image. He has calculated that the retinal image in the emmetropic aphakic eye is half as large again as in the emmetropic normal eye and that this ratio of three to two is lessened by the intervention of any lens.

2. In the aphakic eye there is less depression of light, and it passes at a smaller angle. More light reaches the retina than when the crystalline lens is present, and the advantage is still greater as against an eye corrected by spectacles, particularly if these—whether concave or convex—are of high refractive power.

Under ordinary conditions the removal of a cataractous lens lowers the refraction about 10 dioptres. It is evident, however, that after removal of the lens from a highly myopic eye, there is a greater change in the refraction, usually to about 16 dioptres, or to a still greater degree where the myopia has been extreme.

In selecting cases for operation, moderately affected young eyes without intraocular complication would doubtless give the best results.

Before submitting eyes that have useful sight to interference that might make matters worse, I have so far operated on those whose sight is definitely imperfect. I give details of nine cases, in six of which a visual acuity of $\frac{6}{60}$ could not be obtained with any lens. Two with myopia—15 D. corrected got $\frac{5}{24}$ and $\frac{5}{60}$ respectively, and in the other—22 D. gave $\frac{5}{36}$. One eye (vision $\frac{5}{24}$) had a sound fundus except for large posterior staphylomata. In all the others there existed more or less damage to the choroid, and even at the macula. In four the prognosis seemed practically hopeless as regard sight, but the operations were undertaken, as no special danger was foreseen.

Brilliant results could hardly be expected from such a group of cases, but they are satisfactory enough to make me a strong advocate for operation in high myopia. No hard-and-fast rule could be formulated as to what is a proper case for interference. Where work can be done in comfort even in very high degrees of myopia, the only reason for operation would be to weaken or get rid of the spectacles, and to put the eye under improved conditions as against future deterioration of its tissues. We cannot yet tell whether the eye is rendered more or less liable to danger from complications by removal of the lens.

In cases of high myopia with great discomfort from the spectacles required to give useful sight, or with inability to work or read satisfactorily, the probable improvement by operation should be suggested. As a rule, I should select the worst eye, and be guided by the result on this in interference with its fellow.

Several of my cases who regained useful far sight were unable to read moderate-sized print until assisted by a lens which practically represented their former myopia. This disability in a fairly sound eye would probably become corrected as the retina became accustomed to the altered image. Sometimes it might be advisable to have one eye intact, to be used for reading. Every case must be judged on its merits.

The method of removing the lens will vary with the eyes of the patient—in young eyes, discission with linear extraction; in older eyes, extraction. In young adults, 20 to 30 years, simple extraction might be preferable to discission, which is liable to be followed by recurrent intraocular tension. I have frequently extracted slight zonular cataract, and very immature lenses, by the simple method. A preliminary iridectomy would no doubt simplify extraction.

TABLE OF RESULTS OF NINE EYES OPERATED ON FOR MYOPIA.

<table>
<tr><td colspan="4">DISCISSION WITH SUBSEQUENT LINEAR EXTRACTION OF LENS DEBRIS.</td></tr>
<tr><th>Age.</th><th>Sex.</th><th>Vision Before Operation.</th><th>After Operation.</th></tr>
<tr><td>20</td><td>F.</td><td>R., J. 20, 25 D. $^{2}/_{60}$.</td><td>$^{6}/_{36}$, J. 8</td></tr>
<tr><td colspan="4">Thin choroid; amblyopic; imperfect fixation.</td></tr>
<tr><td>21</td><td>M.</td><td>L., J. 4, $^{1}/_{40}$, no lens helps.</td><td>$^{1}/_{40}$. J. 20</td></tr>
<tr><td colspan="4">Degenerated choroid with large, white, pallid discs; synchisis.</td></tr>
<tr><td>23</td><td>M.</td><td>R., J. 2, $^{1}/_{60}$—22 D., $^{5}/_{36}$, J. 1</td><td>$^{6}/_{60}$+2.50 D., $^{5}/_{36}$, J. 4.</td></tr>
<tr><td colspan="4">Torn choroids; atrophic streaks with pigmentation near macula.</td></tr>
<tr><td colspan="4">EXTRACTION OF LENS WITH IRIDECTOMY.</td></tr>
<tr><td>30</td><td>M.</td><td>$^{2}/_{60}$, J. 1, —15 D. $^{5}/_{24}$.</td><td>$^{6}/_{36}$+1.50 $^{5}/_{24}$,J.16,+14, J.1</td></tr>
<tr><td colspan="4">No definite change of m. l.; large staphylomata; lens measured 10 mm. after extraction.</td></tr>
<tr><td colspan="4">PRELIMINARY IRIDECTOMY AND SUBSEQUENT EXTRACTION.</td></tr>
<tr><td>26</td><td>F.</td><td>J. 18 —22, $^{4}/_{60}$.</td><td>$^{6}/_{12}$.J.6—1.50$^{6}/_{9}$ +1 J. 4</td></tr>
<tr><td colspan="4">Choroidal degeneration: red, velvety macula.</td></tr>
<tr><td>41</td><td>F.</td><td>R., J. 20. $^{1}/_{120}$</td><td>$^{2}/_{60}$. J. 14</td></tr>
<tr><td colspan="4">Synchisis, stretched choroid, degeneration of macula.</td></tr>
<tr><td>64</td><td>F.</td><td>R., $^{1}/_{60}$.</td><td>$^{5}/_{12}$.J.6—1$_{5}/_{9}$+1.50 J.14</td></tr>
<tr><td colspan="4">Myopia —15.</td></tr>
<tr><td></td><td></td><td>L., $^{5}/_{60}$.</td><td>$^{5}/_{24}$. J. 16 +12, J. 1</td></tr>
<tr><td colspan="4">Both eyes large patches of choroidal degeneration.</td></tr>
<tr><td>61</td><td>M.</td><td>L. $^{1}/_{60}$. J. 16</td><td>+3, $^{2}/_{36}$ +5, J. 20</td></tr>
<tr><td colspan="4">Macular atrophy.</td></tr>
</table>

All the patients experienced considerable practical improvement in their power for seeing at a distance.

Dr. Argyll Robertson said the subject under discussion was one of great practical importance to ophthalmic surgeons. The results of the operative treatment, as far as statistics showed, were on the whole satisfactory, especially in those case in which the patients were young, highly myopic—at least 12 D.—with healthy fundus, and who were unable to wear glasses. As regards the method of operating, he considered that that usually followed of discission with subsequent removal of opaque fragments, if employed with antiseptic precautions was thoroughly satisfactory, and was attended with no danger. The improvement of acuteness of vision following the operation shown by statistics was a further recommendation. In most cases a twofold or even threefold improvement may be looked for. At the same time the possibility of the operative procedure predisposing to detachment of retina must not be overlooked, and further experience will be required to decide this point. Whether the removal of the lens may have some influence in checking the advance that is to be feared in cases of high myopia demands a careful investigation. That such may possibly occur is to a certain extent rendered probable from what occurs in cases of extensive necrosis of the cornea with staphyloma imminent, when in accordance with von Graefe's advice the lens is removed, as by such procedure the staphylomatous projection may often be averted. The subsequent history of patients with high progressive myopia in whom one eye alone is operated on should serve to elucidate this point. A point of some importance as regards the question of operating on one or both eyes is the possibility of destroying the binocular vision when it previously existed by operating on one. A divergent squint may also thus result. On the whole it might be advisable to restrict the operation to one eye in those cases where, when looking at a near object, the patient only looks with one eye, and when therefore binocular vision is either not present at all or only imperfect. In other cases the circumstances and requirements of the patient should decide. He had only operated on two cases, as his first feeling with regard to the operation was antagonistic, and he had waited till the favorable experience of others induced him to employ the treatment. The one case was that of a young lad of 18 affected with myopia of 13 D. His power of convergence was insufficient, and he used his right eye for reading. With — 13 D., right eye V. $=\frac{6}{18}$, left eye $\frac{6}{24}$. His mother and three brothers are very myopic. The left eye was operated on on January last, and on July 23d his distant vision without glass was $\frac{6}{60}$, with +3 D. $\frac{6}{12}$. He uses his left eye for distant vision, his right for reading. In this case a twofold improvement in vision was obtained. The other case was that of a young woman, aged 16, whose furthest point of distinct vision was 2½ inches, and who required for the right eye —20 D. sph. = —1.5 D. cyl. axis horizontal for distant vision, V.$=\frac{5}{30}$. The left eye required — 21.5 D. sph. = —1.5 D., cyl. axis horizontal with which V.$=\frac{5}{20}$. operations were performed on the right eye at the end of May and middle of June. The patient was seen on July 27th. The pupil was still partially occluded with fragments of lens, but V. without lens $= \frac{5}{15}$, and no lens caused improvement. Here, too, a twofold improvement in vision had been obtained. His experience, therefore, so far had been very favorable.

DR. P. W. MAXWELL (Dublin) had observed ten cases. It seemed impossible to estimate beforehand what refractive reduction would occur. One case of — 10 D. became emmetropic with V. $= \frac{6}{12}$; another case of —17 D. got $\frac{6}{12}$, with +2.5 D. If we could measure the length of globe, we would know how much of the myopia was due to the lens. Needling should be done freely, and linear extraction soon, otherwise the eye became irritable. After the pupil seemed to be quite free and the vitreous clear, vision often improved for some months. Even when vision was little improved the patient was much pleased with the result, showing that the "working capacity" is improved.

DR. RAYNER BATTEN (London) said he had operated in six cases of high myopia, and the results so far were encouraging; but the first one was only done eighteen months ago, so that it would be rash to talk of the present results as permanent. Of the six cases three had had both eyes done, being sufficiently pleased with the result of the first to wish to have the second eye done also. Two of the cases were now under treatment, and the results as regards treatment were not yet available. Five eyes were completed, and fairly clear pupils: M. T., age 21. Estimated myopia — 20 D. V. corrected $= \frac{6}{60}$. J. 1 at 3 inches. After operation: V. $= \frac{6}{36}$ unaided, J. 14 at 6 inches. A. C., age 9. Estimated myopia, right — 15 D; left — 13 D. V. corrected $= \frac{6}{15}$ badly. After operation: V. right and left + 4 $= \frac{6}{12}$ nearly. J. 4, and J. 2 with difficulty. G. S., age 23. Estimated myopia — 20. V. corrected, right — 16 $= \frac{6}{50}$. After operation: + 3.50 cyl. — .5 sph. $= \frac{6}{42}$ 4 letters. + 3.30 cyl. + 4 sph. = J. 4. F. C., age 4. Estimated myopia —15— 12. After operation appears to have good distant vision. As regards the result of the operation, apart from the actual reduction of myopia by the removal of the lens, he regarded it as positively beneficial to the general condition of the eye operated on. The sclerotics, the anterior portion, became paler and less thinned, less bulged. The choroids appeared of a better color, less stretched and thinned, and even the more definitely affected portions of the posterior pole do not appear so marked. The retinal vessels became more tortuous, less stretched. In one case the hypermetropia resulting from the operation continued to increase for a few weeks from + 1.50 D. to + 4 D. Consequently, in the selection of cases for operation, given a sufficiently high degree of myopia, the evidences of the yielding and stretching of the globe, together with the evidences of active progression, and the probabilities of further progression, form the chief reasons for operating. The age of the patient was chiefly of importance as affecting the degree of myopia at which operation was justifiable; for example, a child under 8 years old, with a myopia of — 10 D, might be suitable, whereas, a patient over 20 years would not be. The occupation and station of life are also of importance. A patient with high myopia who had to work for his living was only suitable for near work while he had his myopia. Without his lenses his range of vision and occupation became more extended and less prejudicial to his eyes. The question of pain and discomfort in the eyes had also an important bearing, as one patient, who had been subject to migrain, had been quite free since operation. In cases of high myopia with small cornea and presumably small highly refracting lenses, with fairly healthy fundi and no marked evidences of yielding of sclerotics, he should hesitate to operate unless the degree of myopia was extremely high. Referring to what he thought was a fairly reliable test of lenticular myopia, he said that if in a fairly normal-looking eye without much obvious bulging, the myopia toward the periphery was not markedly less than at the centre, the myopia was probably lenticular and *vice versa*. Finally, the operation, as he viewed it at present, was not one of convenience but of necessity, and he believed we should come to regard it in many cases as a very unpleasant duty to advise operation as a last possible remedy to an apparently doomed eye.

Eucaine Hydrochlorate.

By G. W. Spencer, M. D., Philadelphia, Pa. *University Medical Magazine*, November, 1896.

"From considerable experience with local anæsthetics, we can safely say that this agent produces the most complete anæsthesia of any drug tried up to date. In none of the tabulated operations performed in the surgical department of Jefferson Hospital with this drug was it necessary to hurry or administer more of the drug on account of pain, and yet two of the operations required 25 minutes for completion. It proved to be harmless in amounts as large as 12 and 15 grains.

"Unlike most of our local anæsthetics, especially cocaine, eucaine does not lose its strength when kept in solution. . . . . Eucaine does not decompose even when boiled. . . . . The solution should always be boiled before using to render it sterile.

"Experiments with this drug on animals would indicate that it is capable of producing positive symptoms. . . . Large doses cause fatal paralysis—the effect on the central nerous system is at first excitant, and later, in tonic doses, paralyzing. . . . . None of these effects have so far been observed in man. . . . .

"In experiments conducted with the end in view of determining the value of various local anæsthetics in operating upon ingrowing toe-nail, the same operative method was practiced in all the cases, no matter what anæsthetic agent was employed. . , . . By the employment of eucaine, the operation was rendered absolutely painless from the begining to the end.

"The amount of eucaine to be used will depend upon the severety and duration of the operation. When the solution is to be injected, from one to two drachms of a 5-per-cent. solution will be sufficient in most cases to cause complete anæsthesia. When the drug is to be applied to a raw surface or to a mucous membrane, if the surface is large, it is best to apply one drachm of a 5-per-cent. solution to the wound, then saturate a thin piece of cotton with a like amount of the same solution and allow this to remain in contact with the surface for five minutes. At the expiration of this time the area can be lightly curetted without pain. After the superficial tissues of an ulcer have been removed by light curettement, apply two or more drachms of the solution in the same manner. Small ulcers can be treated by the same process by using smaller amounts of the drug.

"The time necessary to obtain complete anæsthesia varies; in eleven of the cases the anæsthesia was complete within five minutes after the application. In seven cases it was complete in three minutes after the administration. . . . .

"No systemic effects of the drug were observed in any of the cases. . . . . This drug is a valuable addition to our resources. It is rapid in action, safe, produces positive and prolonged anæsthesia, causes no serious after-effects, and can be rendered aseptic by boiling. It is the best local anæsthetic before the profession. It has been used largely by the ophthalmologists.

"A table is added comprising 20 cases in which this local anæsthetic was used."

A Short Note on the Value of the Immediate Use of Hot Water After Enucleation of the Eye.

By Simeon Snell, F. R. C. S. (Edin.), Sheffield. *Ophthalmic Review*, October, 1896.

"The value of hot water as a hæmostatic in surgical and obstetric cases has been recognized, and its employment has become an established practice It is now several years ago, after hearing a paper setting forth the benefit that hot water had been in some surgical case, that I was led to think it would be of service in controlling the hemorrhage following enucleation of the eye ball. The idea was at once put into practice, and, proving a success has been followed to the present time. Its value is distinct, and the object of this note is to draw attention to the proceeding. The method adopted has been as follows:

"Immediately after the conclusion of the operation, and whilst the patient is under the influence of the anæsthetic, the parts are dried as much as possible with a pledget of cotton wool, and then a roll of cotton wool, which has been dipped in very hot water, is immediately plunged into the socket. Bleeding will often be arrested at once, but, if necessary, the proceeding may be repeated, and then, if the bleeding has not entirely ceased, it will generally amount to no more than a little oozing. The usual pad and bandage may be applied with the eye practically dry.

"Recently I have found a ready means of providing the hot water. A simple beaker filled with distilled water and made to boil over a spirit lamp is always at hand at operations for sterilizing the instruments—a modification of a plan I learned from Mr. Priestly Smith—and the hot water required for the pledget of wool is therefore ready for use.

"My experience has been so satisfactory with hot water as a hæmostatic that the method has been regularly used in my practice. Another advantage, and one perhaps not less important, is that recovery is promoted and the socket is healed some days earlier than would have been the case if the hot water had not been applied. I was much struck with a remark the Sister in charge of my male patients at the Infirmary made the other day. There were two men in the wards who had undergone enucleation of the eyeball. One was operated on four days earlier than the other. On my observing, a few days after the last operation, that this patient was progressing more quickly than the first, the Sister remarked, 'Yes, you used the hot water in this case, but you did not use it in the other.' She further added that she had observed the same thing before when by any chance the hot water had been omitted.

"I have mentioned this observation of the Sister, who has for long had charge of my patients, as it is corroborative of my own impression. I think, also, that the sealing up of the vessels and the general aseptic conditions due to the use of the hot water are features that contribute to a ready healing of the tissues.

"It is possible that others may have adopted this mothod, but, as I have not seen it mentioned, it seems worth drawing attention to."

The Differential Diagnosis Between Simple Glaucoma and Optic Nerve Atrophy.

By Alexander Randall, M. D., Philadelphia, Pa. *The Journal of the American Medical Association*, Nov. 7, '96.

The writer gives the following tabulation of symptoms, remarking that they may be wholly absent, or obscured:

Simple Glaucoma.	*Optic Nerve Atrophy.*
Tension increased.	Normal.
Cornea hazy and anæsthetic.	Normal.
Anterior chamber shallow or obliterated.	Normal.
Iris atrophic and discolored.	Normal.
Pupil dilated and sluggish or fixed.	Small or Dil. (Robertson).
Reflex yellowish-green, "glaucous."	Normal.
Perforating vessels dilated and tortuous.	Normal.
History of pain and obscurations.	Painless loss.
Unilateral character usual at first.	Bilateral generally.
Limitation of field usually to nasal side.	Concentric limitation.
Color-fields commensurate to form-fields.	Disproportionate loss.
Rainbow-vision about lights.	No halos.
Knee-jerks unaffected.	Often lowered or lost.
Optic disc cupped, margins overhanging.	Dished, margins shelving.
Halo of choroidal atrophy usual.	Halo rarer.
Nerve-tissue greenish in shadow.	Nerve bluish-gray.
Arteries and veins pulsating.	Arterial pulsation rare.

The Pneumococcus of Fraenkel as a Frequent Cause of Acute Catarrhal Conjunctivitis.

By H. Gifford. M. D., Omaha, Neb. *Archives of Ophthalmology*. July, 1896.

Dr. Gifford has examined forty cases of acute catarrhal conjunctivitis occurring in Omaha and vicinity and finds that the affection is caused by a different germ from that causing it in New York and Paris. "According to Weeks, acute catarrhal conjunctivitis is, in New York, caused almost exclusively by the small bacillus which he was the first to study thoroughly; and his observations have been confirmed, to a large extent. for Paris and vicinity, by Moran and Beach. Now, since I regard the results of these gentlemen as entirely trustworthy, it is with considerable hesitation that I have brought myself to state that, for Omaha and vicinity, their conclusions do not hold."

After reviewing former experimentation and investigation in this field and on account of the clinical picture of the pneumococcus conjunctivitis, he furnishes proof that the pneumococcus really causes the disease by relating his successful experiments in inoculating with pure cultures, and sums up his very interesting article as follows:

(1) "By for the most frequent cause of acute catarrhal conjunctivitis, in Omaha and vicinity, is the pneumococcus of Fraenkel. (2) The writer has been able to prove that this pneumococcus variety of the disease is directly contagious, and may be caused by pure anærobic cultures of the germ. (3) It is by no means, as has been stated. a disease of childhood, but is quite common among young adults, and occurs, at least as late as middle life."

The Therapeutic Value of Hydrobromate of Scopolamine in Plastic Iritis.

By Charles A. Oliver, A. M., M. D., Philadelphia, Pa. *American Journal of Medical Sciences*. November, 1896.

As a result of nearly two and one-half years of careful clinical research with this drug, the writer has arrived at the following conclusions in regard to the value of the drug in plastic iritis:

1. "Hydrobromate of scopolamine is of the greatest value in the local treatment of the various forms of plastic iritis.

2. "The primary reparative action and quieting power of hydrobromate of scopolamine as compared with those of similar doses of sulphate of atropine in the treatment of

plastic iritis are much more promptly obtained with the former than with the latter drug, this being true in the majority of cases even when the latter drug is used in dosages that are equal to quadruple or quintuple the strengths that are employed of the former drug.

3. "The duration of the healing powers of hydrobromate of scopolamine as compared with those of equal doses of sulphate of atropine in cases of plastic iritis does not seem to be so lasting with the former as with the latter drug, this being true in the majority of cases even when the latter drug is used in four or five times the strength-doses as the former.

4. "For quick and active measures, which are so eminently necessary in incipient cases of plastic iritis, and during the early stages of inflammatory reaction, hydrobromate of scopolamine is to be preferred to sulphate of atropine.

5. "Where prolonged use of such drugs is necessary, as in many cases of the chronic form of the disease with subacute exacerbations, the alternate employment of hydrobromate of scopolamine and sulphate of atropine seems empirically to be the best method of local administration that has been devised.

6. "As clinically employed, the best salt of the alkaloid seems to be the hydrobromate; the best method of instillation appears to be that which is accomplished by dropping the solution upon the upper corneal limbus whilst the lower punctum is everted and the corrsponding canaliculus is pressed upon; and the most efficient amount to be used at one sitting is two drops of a one-tenth of 1 per cent. strength (1 to 500), repeated, if necessary, as often as three times during the course of an hour, and preceded, when desired, as in some instances where there are much irritation and pain, by two drops of a 2 per cent. solution of hydrobromate of cocaine a few minutes before each instillation of the scopolamine."

The Effect of Early Optic Atrophy Upon the Course of Locomotor Ataxia.

By Pearce Bailey, M. D., New York. *Medical Record*, Nov. 14, 1896.

"It has long been observed by neurologists and ophthalmologists that individuals who develop, without assignable cause, an atrophy of the optic nerves may, after a considerable period of time, begin to have lightning pains, or may become ataxic, or present other of the classical symptoms of locomotor ataxia, although typical tabetic symptoms have been delayed for as long as nineteen years, the failure to discover any other cause for the optic atrophy and the frequency of occurrence of this symptom in tabes lend probability to the assumption that in such cases the atrophy was the first manifestation of the systematic degeneration, and that during the interval between the occurrence of atrophy and the beginning of the spinal symptoms the disease was quiescent. . . .

"The proportion of these 'primary' optic atrophies which eventually develop tabes to those which do not is not accurately determined. Gowers states it to be about fifty per cent. . . . Benedikt was the first to attribute to an initial optic atrophy a postponing influence upon the development of the other symptoms of locomotor ataxia; and he went further, and formulated the statement that in many cases of tabes in which atrophy of the optic nerves was an early symptoms the character as well as the course of the disease would be changed. Symptoms sufficient for a recognition of the trouble might develop, but ataxia and pain would not occur. He also maintained that if the atrophy took place after the disease had become symptomatically characteristic the occurrence of blindness would be accompanied by an amelioration of the spinal symptoms." . . .

After giving brief histories of twelve cases of early optic nerve atrophy occurring in one hundred and thirty cases of tabes, the writer concludes:

1. "In about seventy-five per cent. of the cases of tabes in which optic atrophy is an early symptom some of the other tabetic symptoms may be late in appearing or may not develop at all. This is especially the case in respect to the lighnting pains and the incoördination of movement. The loss of knee jerk in such cases is very constant. 2. The most distressing symptoms may develop simultaneously with or immediately succeed the blindness. 3. The association with the optic atrophy of oculo-motor palsies is without prognostic significance. 4. The subject will receive its best elucidation by the observation, over long periods of time, of patients with 'primary optic atrophy.'"

The Correction of Anisometropia.

By Edward Jackson, M. A., M. D., Philadelphia. Pa. *American Journal of Ophthalmology*, October, 1896.

"It is a very common belief that the principal advantage of consulting the ophthalmic surgeon as to the fitting of glasses, is that by so doing the glasses will be adapted to compensate for any natural difference between the two eyes; the difference between the two eyes, as to focus, being regarded as the serious condition that requires the exercise of his special skill. It is the universal rule laid down in text-books of ophthalmology, and practiced by all who attempt to make exact measurements of the refraction of the eye, to test the two eyes separately; and in general to give each eye its proper correcting lens. This is done unless the difference between the two eyes is so great that they cannot be made to work together; in which case, the general rule is to correct the refraction of the better eye, and to give the other eye a corresponding glass, disregarding in the main, the condition of refraction present in it.

There has been, however, no general scheme of clearly formulated rules by which it might be determined when a particular case presented such differences in the refraction of the two eyes as to preclude the probability or possibility of their being habitually used in accurate binocular vision; nor have the factors which enter into the determination of these limits for the proper correction of anisometropia been generally studied or carefully discussed. Anisometropia, like ametropia in general, makes trouble either by preventing perfect vision, or by making it difficult to attain, so that the benefit of it is only secured at the cost of eye-strain. And, as with the various forms of ametropia it is in the higher degrees and in later life that it entails imperfect vision, and in the lower degrees and earlier life that it causes eye-strain.

The careful investigations as to tho normal power of overcoming differences of focus between the two eyes by differences of accommodation, reported by A. Fick, of Zürich ("On Uneqal Accommodation in Healthy Eyes and in Anisometropia," *Archives of Ophthalmology*, 1889, p. 292) in direct contradiction to those of earlier observers indicate that there is some power of overcoming anisometropia by unequal accommodation, but the extent of inequality that may be thus overcome is strictly limited to 1. D. or at the most 1.5 D. Some of Fick's observations in this direction

I have been able to partly confirm. When the amount of anisometropia is less than 1. D. or 1.5 D., the patient may not be conscious of seeing any better with one eye than the other, and equally good and simultaneous vision may be found on careful testing; but the use of the eyes entails symptoms of eye-strain that may be out of proportion to the refractive error in either eye considered alone.

Where in one eye the ametropia is of such low degree as to entail eye-strain, while the difference of refraction between the two eyes is so great as to preclude the focusing of both together upon the same subject, the patient will not suffer from eye-strain. If, however, the second eye presents ametropia of low degree, distinctly differing in kind or degree from the ametropia of the first eye, symptoms of eye-strain are very liable to develop."

The Wearing of Veils and its Effects upon the Eyesight.

By Casey A. Wood, M. D., Chicago, Ill. *Boston Medical and Surgical Journal*, Dec. 3, 1896.

"Although we hear and occasionally read of the ill effects produced by veils upon the eyesight, very little has been done in the way of determining the exact degree of interference with vision which these ornamental, and occasionally useful, protectors bring about.

"The fact that the wearing of veils is productive of weak eyesight, headaches, and sometimes vertigo and nausea, is within the experience of every ophthalmologist. Not only are these effects produced by the eye-strain consequent upon the added efforts made by one or both eyes to see through or around an obstruction, but the irregular figuring on the veil itself is, in some instances, a source of annoyance to the wearer. As in other cases of abuse, the burden rests heaviest upon the weakest eyes, and probably the reason why one encounters so comparatively few instances of asthenopia directly due to veil-wearing is that the embarrassed eyes are able to overcome the additional strain where the vision is normal, the oculo-muscular system in proper equilibrium and the general health good.

"For the purpose of demonstrating the extent to which veils of various kinds influence the eyesight, I had selected for me a dozen typical specimens, and made with them a number of experiments. I now report the most important of these, namely, that which refers to their direct effect upon the vision." . . . .

The writer tested the effect upon the eyesight of a dozen different kinds of veils and arrived at the following conclusions:

(1) "That every description of veil affects more or less the ability to see distinctly, both in the distance and near at hand. (2) The most objectionable kind is the dotted veil, although the influence of this variety for evil is more marked in some samples than in others. (3) Other things being equal, in undotted and non-figured veils, vision is interfered with in direct proportion to the number of meshes per square inch. (4) The texture of the veil plays an important part in the amount and kind of eye-strain produced by the veil. When the sides of the mesh are single, compact threads, the eye is embarrassed very much less in its effort to distinguish objects than when double threads are employed. (5) The least objectionable veil is that without dots, sprays or other figures, but with large regular meshes made with single, compact threads."

"As I have said, it is not a necessary consequence of the wearing of veils that eye symptoms result. A healthy eye in a healthy body resists the strain of an impediment to vision just as it does other deleterious agents; and it is only when from other causes the eye-sight is weakened that the wearing of an objectionable veil proves immediately and obviously hurtful. I have noted many cases of headache and painful vision, as well as other ocular symptoms, produced by veil-wearing in persons whose eyes are not over strong; and I believe that this practice is one of the agents, not perhaps always recognized, that contribute to ocular discomfort."

EXTRACTS FROM CURRENT SPANISH OPHTHALMIC LITERATURE.

By Dr. Albert B. Hale,

CHICAGO.

Treatment of Immature Senile Cataract.

El Siglo Medico (Madrid, 27 Sept., 1896, No. 2231) quotes an article by Dr. del Toro from the *Anales Medicos Gaditanos*, discussing the treatment of immature but quiescent cataract. del Toro, after stating that some patients reach a condition in which the cataract does not go on to maturity, says there are two ways of considering the conditions for operating, one a merely physical. the other a moral obligation. If a patient cannot see more than fingers and has lost his acuity, something must be done, and either discission on Forster's artificial ripening can be performed. Ripening, however, is not a genuine maturity, it is actually a trauma, and either operation becomes therefore a serious matter. Supposing that only one out of 500 cases so handled results disastrously, it shows however that the danger is there, and considering the good results in extraction, even when the cataract is not thoroughly mature, del Taro prefers early extraction to artificial ripening.

Spanish Methods in Operating.

In *El Siglo Medico* (No. 2218, June 28, 1896) *Dr. Santa Cruz* tabulates the operations at his clinic for the past year. In his comments on the table he notices that there were only seven operations for squint, which represents by no means the number of patients presenting that condition, but rather the proportion of those who had courage to submit to an incision when there seemed no vital necessity for it. The author always advances the muscles more than enough to effect the proper correction at the moment, because he finds that some retraction will follow. In pterygium he cauterizes the lips of the wound up to the corneal edge. In 346 cases of cataract extraction there were two cases of suppuration. In dacryocystis no sound is used unless there is pus. In such a case the sac is opened and cauterized with the acid nitrate of mercury.

ABSTRACTS FROM GERMAN OPHTHALMIC LITERATURE.

Quarter ending January 1, 1897.

By H. V. Würdemann, M. D.,

128 Wisconsin Avenue,

MILWAUKEE, WIS.

Myopia.—Striped Opacities of the Cornea.—Filtration and Secretion of the Aqueous Humor.—Accommodation Theory of Tscherning.—Carcinoma Spongiosm of the Iris.—Puerperal Septic Embolism of the Eye.—Predisposing Causes of Trachoma.—Argentamin.—Striped Keratitis.—Differentiation of Diptheria of the Conjunctiva by Serum.—Serum Treatment in Conjunctival Diphtheria.—Diagnostic Importance of Newly Formed Blood Vessels in the Cornea.—Elastic Fibers of the Eye.—Embollism of the Central Retinal Artery.—Detection of Simulated Monocular Blindness.—Eye Disease in the Malay.—Cancroid of the Cornea.—Pemphigus Neonatorum and Impetigo Contagiosa.—Enucleation of the Eye under Cocain.—Sarcoma of the Choroid.

Myopia.

Heinrich, W. *(Archiv. f. Ophth, XLII. 3, 1896.)* If the reflection of the ophthalmoscopic mirror upon the anterior capsule be observed with the naked eye or with instruments in different persons it will be found that with the same degree of light the reflection is hardly visible in one person, while in another it is very bright. H. shows by his examination of ametropes, hypermtreopes and myopes, that this is due to the difference of refraction. The appearance of the reflection upon the anterior lens capsule keeps pace with the degree of the myopia. H. V. W.

Striped Opacities of the Cornea.

Schirmer, O., *(Archiv. f. Ophth,, XLII. 3, 1896)*, considers striped opacities, such as the so-called "striped keratitis," after cataract extraction, which appear a few days after the operation, as a system of fine connecting gray stripes; proceeding from the wound and between which the cornea is more or less transparent. By experimentation upon rabbit eyes examined 8 or 10 days after the lenses had been extracted, the opacities were found to be due to raising and folding of Descemët's membrane, three or four of the deepest corneal layers being also implicated in the swelling. The epithelium and endothelium were perfectly normal and there was no increase of the nuclei. He concludes that the process is an edema; that there is no trace of inflammation: that the name of striped keratitis is inapplicable and the process should be called striped opacification.

The opacification itself is due to the unequal refraction of light and not an increase of connective tissue cells. The same process occurs in hypopion keratitis and in deep ulceration with the addition of cell infiltration. The stripes appear and disappear in from 5 to 15 days, are seen to be due to folding of the membrane of Descemèt. They are seen by oblique illumination to be transparent and are due to irregular refraction. He thinks they are identical with that found after cataract extraction. They are usually not seen in the highest of intensity of inflammation, but often in the retrogressive stage. They do not proceed from the spots of greatest inflammation, but from the corneal center. He has innoculated a number of eyes with the staphylococcus pyogenes, producing l hypopion keratitis, followed in several cases by this striped formation, finding in microscopic examination that the stripes were due to folding of the membrane of Descemèt and deeper layers of the cornea. He has been interested in a peculiar form of opacification of the cornea which he described as "felderförmige," in which the opacification has a grayish hue, apparently lies in the deepest layers of the cornea and is characterized by a number of dark lines which run together, producing irregular straight sided, sharp cornered fields. This is likewise due to folding of the deeper layers of the cornea and the Descemèt membrane.

He has examined three cases which came to enucleation. In another case he found folding of the membrane of Bowman in a shrunken eye which was enucleated for pain. In this case there were changes in all the layers, but the folding was most pronounced in the membrane of Bowman.

H. V. W.

Quantitative Relation of the Filtration and Secretion of the Aqueous Humor.

MESNAMOFF, E. *(Archiv. f. Ophth., XLII. 4.)* It has been definitely ascertained that the aqueous humor is secreted by the ciliary processes and in part from the posterior surface of the iris, and that its outflow is through the spaces of Fontana through filtration into Schlemm's canal and the perforating anterior ciliary veins. The amount of secretion is not well known. Leber has ascertained that in freshly enucleated eyes most of the filtration is outward from the anterior chamber but in living tissues is largely through the vessels. Experiments should be made with fluid similar to the aqueous humor, such as normal salt solution, as other fluids and distilled water hinder filtration by causing swelling of the connective tissue or by choking the lymph spaces. Leber and Bentzen found interference of the filtration in normal human and animal eyes similar to that of glaucomic eyes in such experiments. Bentzen found that filtration in freshly enucleated rabbit eyes was about 6 cb. mm. to the minute, varying in several examinations from 4.2 to 7 cb. mm. In human eyes two hours after death, by the use of distilled water impregnated with Berlin blue, the filtration was only 1.2 cb.mm. to the minute, but with a mixture of acid Fuchsin and Berlin blue it was 2 cb. mm. to the minute. Bentzen and Leber believed that in these experiments the coloring matter stopped up the pores of the tissues and hindered filtration. The experiments of other authors are quoted.

M. has contrived a manometer made of solid material by which he has made a large number of examinations upon living and dead eyes of men, rabbits, dogs, pigs, sheep and oxen, and gives a number of tables showing his results with the following conclusions:

I. The physiological salt solution filtrates with undiminished strength through the ciliary angle of dead eyes.

II. Filtration increases proportionately to the pressure of the apparatus and also to the intraocular tension.

III. Filtration in different animals eyes depends upon the dimensions of the anterior chamber, that is, upon the sizes of the vessels. Fluids in which insoluble substances are suspended stop up the pores of the tissues and hinder filtration.

IV. The pigment of the ciliary processes and that of the iris may also hinder filtration if it is loose in the anterior chamber.

V. Filtration in eyes taken postmortem from human beings proceeds the same as in freshly enucleated eyes of animals.

VI. Filtration of the aqueous humor in the eyes of animals is the same as that in enucleated eyes, and depends upon the same conditions of the apparatus and the tension.

VII. The excretion of the aqueous humor is proportional to the difference between the intraocular pressure and the pressure in the vessels.

VIII. The excretion of the aqueous humor is by filtration through the walls of the vessels of the ciliary body, whereby the pressure in the vessels is rendered about double that of the intraocular tension. H. V. W.

The Accommodation Theory of Tscherning.

CRZELLITZER, A. (A Complementary Study of Tscherning's Work and Methods of Examination.) *(Archiv. f. Ophth., XLII. 4, 1896).* This article, as the name implies. goes over the field, thoroughly showing the refraction in several zones of the lens, during rest and accommodation, showing the spheric abberation, difference in refraction for central and eccentric rays of light, and what is especially interesting, the varying shape of the lens. He shows that the theory held by Helmholtz that the vertical diameter of the lens becomes smaller during accommodation is improper, and that the diameter is but little changed, the reason being the dishomogenity of the lens. He has devised a special instrument for physiological experiments

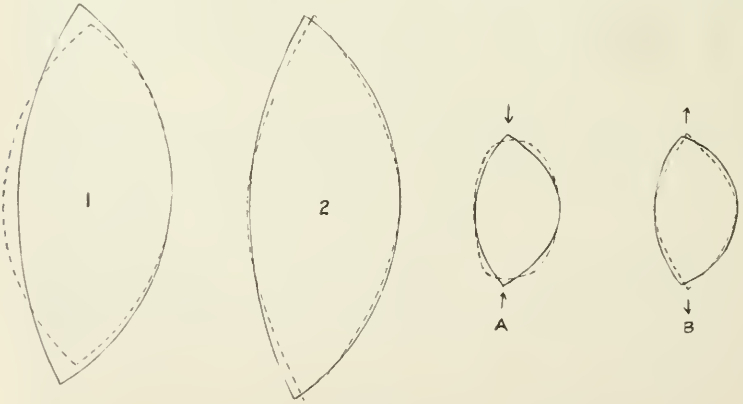

Fig. 1.

upon the lenses of animals. He shows that compression upon the zonula changes but little the antero-posterior curvature, but that pulling open the equator increases the curvature. *(See Figure.)* In rest the lens is somewhat ellipsoidal: when the zonula is tense the lens sinks backward.

1. (Enlarged about fifteen times.) The lens of the schematic eye of Helmholtz. The dotted line represents the shape of the lens during accommodation of 6.5 D.

2. (Enlarged about fifteen times.) The full line represents the shape of the lens in rest, according to Helmholtz; the dotted line shows the lens in accommodation, according to Crzellitzer and Tscherning, in accommodation of 7.5 D.

A and B. The whole line represents the spherical surfaces showing the form of the lens when at rest. The dotted lines A when the equator of the lens is compressed; B when the equator is stretched.

Crzellitzer concludes as follows:

I. The effect of accommodation is less upon the peripheral parts than upon the middle portion. From this it follows that the surface of the lens in accommodation must have a greater curvature in the center than at the edges.

II. This hyperboloid rotation occurs in all the peripheral surfaces.

III. The reflexes upon the anterior surfaces of the accommodating lens show that the peripheral portions are flattened and especially that its shape becomes hyperbolic.

IV. Stretching of the zonula does not flatten the entire lens but changes the spheric curvature so that it is rendered greater in the center and less on the edges.

V. It is thus shown that during accommodation the stretching of the zonula renders the spheric surfaces of the lens hyperbolic. Article contains 35 illustrations and literature is freely quoted. H. V. W.

Carcinoma Spongiosum of the Posterior Surface of the Iris.

HIRSCHBERG, J. and BIRNBACHER, A. *(Centralbl. f. prak. Augenheilkunde, Oct., 1896).* The only true intraocular epithelial cells are developed from the epiblast and from posterior layer of the anterior capsule of the lens and never develop into true tumors. True intraocular cancer has hitherto never been found as a primary infection. H. and B. report the following as unique case of true cancer developing from the posterior surface of the iris in a 26 year old man, who one and one-half year before had an inflamed left eye which had been treated by poultices, growing better in three weeks, though afterward the vision diminished, the right eye remaining healthy. Four weeks before examination he had the greatest pain and lachrymation. Examination showed the right eye normal; the left eye vision reduced to counting the fingers at 30 inches, and its visual field contracted on nasal side to 12°, tension plus 2, the eye ball slightly reddened mainly from enlargement of the scleral veins, pupil oval, iris thinned and pigmented in the upper part. A gray mass was observed in the temporal side of the pupil, the lens opaque and pushed backward. A diagnosis of new growth of the ciliary body or of the posterior surface of the iris was determined and iridectomy for diognostic purposes was made after which healing followed. Three weeks later the eye was removed under cocain anesthesia on account of severe pain which injection of morphin had failed to relieve. When the patient was seen more than two years afterward, the right eye and the left orbit was found healthy. Macroscopic examination of the divided eye ball showed a tumor 10 mm. × 5 mm. arising from the posterior surface of the iris pushing the lens backward. Microscopic examination showed characteristic spongy cancer of the posterior epithelium of the iris with increase of the pigment layer but with little change in the iris tissue proper. The retina was not implicated. The growth was composed mostly of large epithelial cells with well developed nuclei which sometimes held vacuoles and had a large amount of protoplasm. These cells were attached to each other without interlying tissue and were arrayed in tubular form. The histologic structure showed this tumor to be a true carcinoma. Article is illustrated by 8 micro photographs.

H. V. W.

Two Cases of Puerperal Septic Embolism of the Eye.

JANERSKIERWICZ, M. *(Centrbl. f. prak. Augenheilkunde. XX. 1896).* These cases were seen in Hirschberg's clinic and are particularly interesting in that puerperal sepsis with embolism of one or of both eyes is seldom observed. One was in a 38 year old woman who had fever after abortion. Eight days after the birth the left eye became diseased and two days later was blind. Numerous abscesses had to be opened. After a few months the left eye suppurated and eventuated in phthisis bulbi. The woman recovered without albuminuria. The second case was a woman aged 36, had four days after her seventh normal childbirth a fever which lasted eleven weeks. A few weeks later both eyes became swolen and blind. Both eye balls became phthisical and pus developed in the left knee. Patient disappeared one-half year afterward.

Predisposing Causes of Trachoma.

BULL, OLE, (*Centralbt. f. prak. Augenheilkunde., Nov., 1896*), believes that trachoma is an infectious disease but is in doubt as to its contagiousness. He does not agree with v. Millengen that unhygienic surroundings, racial predisposition and altitude are the principal factors. He also disagrees with him in regard to its occurrence among Scandinavian folk and cites his experience of 15 years among 14,000 patients in Norway where he has seen only five or six cases of trachoma. He states that among the poor folk of this conntry "changing of the clothing and the use of towels are an unnecessary luxury." In the U. S. A. the Scandinavians are however frequently affected. The disease is prevalent among the negroes in Constantinople, whereas in the U. S. A. the colored population is practically exempt. He allows that the Celtic race are however notably predisposed. The height above the sea and the amount of illiteracy have likewise little to do with the number of cases. He concludes that the plasmodium of Kruedener is probably the active agent in producing trachoma. H. V. W.

Argentamin.

HOOR (*Klin. Monatsblatt f. Augenhlkde. July, 1896*), recommends argentamin as a substitute for silver nitrat in eye affections where the latter is indicated. Argentamin is chemically ethylen-diamin-silver phosphat. Unlike silver nitrat, which when crystallin is acid in reaction and when fused neutral in reaction, argentamin is alkalin, and this accounts for the fact that its application causes only slight and transient local reaction, a point much in its favor. It never gives rise to a deposit on the abraded or ulcerated cornea, which nitrat of silver sometimes does; nor to the staining of the conjunctiva; nor to the disagreeable metallic taste associated with the use of the latter. It may be used in a 3 or 5% watery solutions, once or oftener if required. It seems to have all the advantages and none of the disadvantages of silver nitrat. H. V. W.

Mestatatic Carcinoma of the Uveal Tract in Both Eyes

ABELSDORFF, G., in Berlin, *(Arch. f. Augenhkde. XXXIII. 1 & 2, 1896).* In a 40 year old woman with carcinoma of the left breast A. found binocular retinal detachment and yellowish white coloring of the fundi. Examination of the eyes after death showed carcinoma of the choroid in both eyes following embolism caused by carcinoma cells carried by means of the posterior ciliary arteries. Three plates of microscopic preparations are shown. H. V. W.

Striped Keratitis.

HESS, O., *(Archiv. f. Augenhlkde. XXXIII. 1 & 2. 1896.)* was the first to describe the so-called striped keratitis after cataract operation to folding in the deeper layers of the cornea, found the same condition in an eye which had been perforated by a sharp instrument. Descemet's membrane and epithelium were entirely normal. H. V. W.

Antisepsis or Asepsis in Operations upon the Bulb.

BACH, L., *(Archiv. f. Augenhlkde. XXXIII. 1 & 2. 1896.)* from his bacteriologic studies, considers that asepsis is all that is necessary in ophthalmic surgery. Antiseptic treatment does not destroy all the germs and iritates the conjunctiva causing a catarrhal condition which is not at all favorable for operations. He recommends the lids to be wiped thoroughly with sterilized cotton tampons and the cul-de-sac to be washed out with physiologic salt solution. H. V. W.

Etiology of Conjunctival Pseudo-membranes.

SCHANZ, F. R., *(Archiv. f. Augenhlkde. XXXIII., 1 & 2. 1896.)* has observed membrane formation in four patients with inflammation of the conjunctiva in all of which bacilli were discovered which could not be differentiated from the Klebs-Loeffler bacillus. The inflammation occurred in a child two years old and in three grown persons. In one of these something had blown into the eye while upon the street; in another there was a piece of wood and in the third hot cigar ashes. In all four cases the disease was quickly and happily removed without the employment of serum. Schanz decides that the malignant bacillus may be found in pseudo-membranous conjunctivitis as well as harmless forms. H. V. W.

A Case of Cavernous Angioma in the Deeper Part of the Orbit Removed With Preservation of the Eye Ball.

KNAPP, H., (*Archiv. f. Augenhlkde, XXXIII., 4, 1896*), removed, after division of the rectus muscle, a congenital typical cavernous angioma which had been growing slowly, reaching a length of 27 mm. and a width of 24 mm., pushing out the eye ball 10 mm., formed in Tenon's capsule, which had not produced much change in the tissues. The eye ball preserved its proper movement and the vision after the operation. H. V . W.

Chlorosis and Papillo-retinitis.

DIEBALLA (*Deut. Med., Woch., July 9, 1896*) describes a case in a girl 21 years of age, in which optic neuritis occurred in the course of chlorosis when she was 14 years old. Recently she had complained of severe headache and vertigo, but there was no vomiting. The menses were irregular. In March she had mistiness of vision and in reading letters appeared blurred. On admission (April 10th) there was marked anemia. The hemoglobin was 31 and the red blood cells 3,880,000. The number of white cells was 7,200, and the specific gravity of the blood 1,040. Papillo-retinitis was present on both sides and there was slight paresis of the left abducens nerve. On April 20th vision in both eyes was $\frac{5}{7}$. The right papilla was grayish-red and swollen, the outlines of the disk being very blurred. The veins were wide, the arteries narrow and the vessels in the places covered with exudation. The left disc showed similiar changes. In May the neuritis was much less marked, and in September the patient was quite well. The body weight had increase 4 kilog. The hemoglobin was 75, the number of red cells 4,200,000, the white cells 5,000 and the specific gravity was 1,055. The fundus oculi was quite normal. The neuritis was undoubtedly caused by chlorosis, all other causes having been excluded. Such a complication of chlorosis is exceedingly rare The author then refers to recorded cases by Gowers and others. The explanation is still quite hypothetic. Sometimes a loss of blood produces disturbance of sight due to neuro-retinitis. In the above named cases overexertion (dancing) made the chlorosis suddenly worse. Suddenly after this overexertion, menstruation reappeared, and the author assigns the neuritis to these two deglobulizing factors. The intense headache in this case along with the neuritis suggested the possibility of a cerebral tumor. Rest and iron treatment, however, soon caused the headache to disappear. H. V. W.

Non-malignant Diphtheria of the Conjunctiva and its Differentiation from True Diphtheria bv Behring's Serum.

Sproneck, C. H. H.. *(Deut, Med. Wochensch. No. 36, 1896).* The theory of specific immunity which Pfeiffer has advanced for the vibrio of cholera and the bacillus of typhoid has been carried further in this article of Spronek's, to even the diptheria and its relation to the bacillus xerosa, which has been described by other authorities as weak or non-malignant. In the examination he used three kinds of xerosa bacillus cultures which had caused light local and general symptoms in guinea pigs, which had been rendered immune to true diptheria and which observed the same slight local and general symptoms that occur in normal animals, although these immune animals had showed no symptoms after inoculation with much stronger cultures of the Loeffler's bacillus. The non-relation of the bacillus xerosa to true diotheria is accordingly proven.

H. V. W.

Serum Treatment in Conjunctival Diphtheria.

Greefe, R. *(Deut. Med. Wochensch., Sept. 10, 1896),* gives a summary of recorded cases and discusses them under four headings. (1) Serum treatment in genuine diphtheria and favorable action would be attributed to serum in 37 out of 42 cases, and in only 2 cases did death occur. (2) Serum treatment in pseudo-diphtheria and slight cases of so-called conjunctival croup are often due to Lœffler's bacillus. In severe cases it may be impossible to say from clinical evidence whether it is genuine diphtheria or not. In cases not caused by the diptheria bacillus the serum treatment is aimless, but in the author's opinion, harmless. (3) Post-diphtheritic ocular paralysis after the serum treatment. Ocular paralysis only occurs after genuine diphtheria. It supervenes generally after three weeks and attains its height in a few days. In Gutmann's cases a large number of cases of paralysis as well as a severer type were noted after the serum treatment. In 16 cases in the author's clinic it appeared that the serum treatment had no effect upon the occurrence of the ocular paralysis. (4) The effect of the serum on the course of the paralysis. The number of cases is yet too small to base conclusions upon regarding progress. In summarizing results the author observes that the severe forms of conjunctival diphtheria prove a test of the value of the serum treatment, for formerly the most careful treatment was of no avail, nearly all the cases dying. In one of the two cases before referred to, the cause of failure lay in the mixed infection, but in the other cases the diphtheritic process extended in spite of the treatment. Local treatment may also be adopted. In pseudo-diphtheria due to staphylococcus, pneumococcus, etc., the serum treatment is without effect. Such cases are often more dangerous than slight cases of diphtheria. In mixed infection the serum treatment is indicated. The serum treatment constitutes no prophylaxis against ocular paralysis. No striking result has been obtained by the serum in post-diphtheritic ocular paralysis, but since these cases almost always terminate favorably under ordinary treatment, nothing further is required. H. V. W.

Newly Formed Blood Vessels in the Cornea and Their Diagnostic Treatment.

HIRSCHBERG, J. *(Deut. Med. Wochensch, No. 38, 39 and 41., Oct. 7,-14,-28, 1896.)* The transparency of the cornea is not so seldom impaired by newly formed blood vessels. The question arises how this occurs in normal as well as diseased conditions. The first investigator of this subject was Ben-el-Razi, in the year 900, and has been reported upon by very many since his time. Anatomic examinations have been upon artificially injected human and animal eyes even in the last century, which showed that the cornea contained spaces so fine that they would allow fluid to pass, but did not allow entrance of the blood corpuscles, but which by inflammation became widened, forming vessels which then became visible, and allowed a passage of blood corpuscles. Hyrtl had, in 1869, injected animal eyes shortly after death which seemed to show the existence of a precorneal ring of vessels which converged from all sides toward the center, and concluded that this showed the persistence of embryonal corneal vessels. Schoebl. in 1896, describes this condition as pathologic, and from a large number of injected preparations shows that precorneal blood vessels do not exist in fœtal eyes of human beings and mammalia; there is a system of blood vessels around the cornea, and in superficial inflammation of the cornea these new blood vessels spring forth from the conjunctival and episcleral vessels and in deep inflammation of the cornea may connect with the scleral. The newly formed superficial vessels of the cornea anastomose in a branching manner. The deep vessels remain single, each artery accompanied by its vein. Hirschberg has studied for a number of years the new formed blood vessels in the cornea with the loupe and with the ophthalmoscope. In most cases it is necessary to decidedly enlarge the image by convex lenses in order to render the vessels visible. He finds such in diffuse inflammation of the cornea and in those of syphilis, and states that the newly formed blood vessels never entirely disappear, but may be discovered by a strong corneal loupe. Diffuse inflammation of the cornea begins on one portion of its edge, with formation of new blood vessels which may be always seen if the pupil be dilated and the eye examined with the loupe under the reflector. It is important to discover whether or not syphilis be present in children, some of whom have perfectly healthy parents, all relations healthy and no history of miscarriage in the family. In some of these cases it is certain that the child has been infected by the midwife. Deep ulceration of the cornea heals through formation of new blood vessels which come from the edge of the cornea, and are commonly called "reparation pannus." Years after such are healed, examination with the loupe shows that the cicatrices are filled with small blood vessels. In trachoma the entire cornea may be covered by a mesh of blood vessels, which after healing, are not apparent to the naked eye, but which may be discovered by the loupe. The article is freely illustrated and literature extensively quoted. H. V. W.

The Elastic Fibers of the Human Eye.

STUTZER, H. G., (*Deut. Med. Wochensch. No. 42. Oct. 15, 1896*), has examined preparations of the eye prepared in the following manner: The eye being hardened in alcohol and imbedded in celloidin, then removed from 75% alcohol and allowed to remain for 24 hours in the following solution:

℞

Sol. Orcein 1%	100
Water	50
Hydrochloric Ac. gtt.	50

then washed in 96% alcohol, then in absolute alcohol and afterward in oil of organum or oil of bergamotte, finding that not all of the fibers are colored the same and that they differ in eyes. He finds that the fibers are numerous in the episcleral tissues and at the ciliary angle. In the central part of the sclera he has found a few small fine fibers which are also present in quantity at the insertion of the ocular muscles and at the limbus. There are strong elastic fibers between the conjunctiva and the sclera as well as in the cornea. Those in the ciliary body may be divided into a number of groups. One is found in the wall of the angle of the anterior chamber and in the root of the iris, which forms a ring. The second group is found in the intermuscular tissue of the muscle. The choroid is rich in elastic elements which anastamose with corresponding fibers in the ciliary body. H. V. W.

Embolism of the Central Retinal Artery.

EHRLE, CARL *(Inaug. Diss. in Tubingen 1896)*, describes 21 cases of partial and complete embolism of the retinal arteries in Schleich's clinic in Tubingen or in his private practice. Such cases bear relation to other eye diseases of 1 in 3,600 in the clinic or 1 in 1,600 in private practice. There were 7 who had heart affection and 3 with arteriosclerosis. The embolism was total in 12 cases and partial in 9. In a few of the cases nerve atrophy followed. One case received better vision after treatment by massage. In other cases iridectomy and paracentesis were done without any result. H. V. W.

The Detection of Simulated Monocular Blindness.

HAYMANN, *(Deut. milit. arztl Ztschr. XXIV. 8 and 9. 1896)*, recommends in monocular simulation two prisms 14° bases turned toward each other to be held before the eye so that between the two prisms a small slot as wide as the pupil may be left and then before these prisms and the supposed blind eye colored glasses are held during the candle test. Red and green pieces of paper upon a black background are also tried under red and green glasses.

In very sly persons, Haymann recommends method of Froehlig *i. e.* atropin is introduced, by the operator's finger, into the eye that is claimed to have good sight by the simulator, and after the atropin has taken effect the reading test is renewed. H. V. W.

Statistic Report on 3104 Cases of Eye Disease in the Malay Race.

Steiner, L. *(Soerabaya, Java). (Sond-Abdr. aus (Geneesk Tijdochr. voor Nederl, Indie XXXII., 1. 1896).* Steiner found 30% of all eye diseases (952) to be trachoma which is also shown by the common occurrence of entropian operations. Hypopion keratitis and lachrynmal disease is very rare. There were 17 cases of symphlepharon. Steiner thinks that phlyctenular disease is very rare on account of the Malays being both day and night so much in the open air. Squint and also anomalies of refraction are rare, while pterygium and pseudo-pterygium are common. There are 71 cases of tatooing of the cornea operated upon by a method which Steiner recommends as easily and rapidly done. H. V. W.

Cancroid of the Cornea Arising from the Apex of a Pterygium.

Steiner. L. *(Soerabaya. Java). (Sond-Abdr. aus Centralbl. f. prak. Augenhlkde, Marz. 1896).* On an old Javan on the apex of a pterygium of the inner half of the cornea of the left eye there was a tumor 5 mm. long and 1 mm. thick, covering a clear and unchanged cornea. Steiner removed the pterygium and growth finding the latter to be a cancroid with stroma very rich in cells. H. V. W.

The Relation Between Pemphigus Neonatorum and Impetigo Contagiosa.

Bahr. *(Zeitschr. f. Medicinalbeamte, No. 9, 1896).* found 10 cases of pemphigus neonatorum in the practice of one midwife which had pursued their course without noticable general symptoms. Nine cases were cured and one died with intercurrent capillary bronchitis. These cases were remarkable for their contagiousness and the tenacity with which the disease stuck to each person. The attending midwife was clean and trustworthy and had used means to prevent infection. Bahr specially writes about three cases occurring in new-born infants which had been carried to them from other members of the family which had caused in the other children and in grown persons typical impetigo-contagiosa. The proof that both diseases are due to the same cause can only be determined by bacterologic examinations, such as Vauselow has made, but as yet conclusive proof has not been obtained. H. V. W.

Enucleation of the Eye Under Cocain.

MOHR, M., *(Wien. Klin. Rundschau, Aug. 30. 1896)*, reports five cases of enucleation of the bulb under cocain anesthesia. The drug was used in 5% solution and was dropped repeatedly in the conjunctival sac till the eye was insensitive. The operation was then rapidly performed, and was quite painless. One of the patients was an old man aged 84, emphysematous and with a hypertropied prostrate; the heart was much dilated and there was some cystitis, so that the administration of a general anesthetic would have been a very serious matter. The eye trouble was glaucoma. Another glaucomic case treated with equal success was in a child of eight months; the glaucoma was here secondary to tubercular iritis. He considers injection of cocain or the use of chloroform to be unnecessary. H. V. W.

Sarcoma of the Choroid in the Macular Region with Extension into the Orbit.

PANAS, PROF., in Paris. *(Wein. Klin. Rundschau N. 38, 1896)*. A fifty year old woman had fallen 10 years before on right side of head, soon after which right eye became inflamed and light shy and the vision decidedly diminished. In 1892 the woman, who was otherwise healthy could count fingers only at 30 cm. The ophthalmascope showed a large white spot in the posterior pole near the papilla. The tension of the eye not being reduced by repeated sclerotomy it was enucleated. In attempt to cut optic nerve some distance back of the eyeball there was discovered a large tumor in the orbit which had to be removed. The anatomical examination showed following interesting points: On posterior pole was a flat sarcoma of the choroid without retinal detachment; the tumor had neither gone forward into the vitreous nor through the sclera, but had spread by means of the orbital fatty interstitial tissues through the scleral ring. The growth in the eye was composed of spindle-shaped elements and pigment with few vessels. The outer tumor had an alveolar structure. The tumor did not return after removal. Patient was later fitted with an artificial eye. H. V. W.

The Operation for Secondary Cataract

is exhaustively discussed by J. da Gama Pinto. of Lisbon. in *Klinische Monatas blatter fur Augenheilkunde*. September. 1896. Knapp is quoted as the most pronounced advocate of discission. having resorted to it in 60 per cent. of his cases, while Gayet is said to go to the other extreme, having expressed a fear of the operation. and his opinion is that discission is always doubtful, often unnecessary. and sometimes dangerous. De Wecker seems to support Gayet on theoretical grounds. doubting the advisability of irritating the vitreous. but da Gama Pinto inclines to Knapp's views. and has himself performed discission in 61 per cent. of 529 cases. Da Gama was for eight years assistant in Heidelberg at Becker's clinic. who was also opposed to discission.

Asepsis and antisepsis have done much to ward off the dangers of the operation. and while Knapp has never lost an eye after discission. others have (the author reports two cases of suppuration in 326).

Knapp concludes that the result of discission is. in many cases. even better than that after the primary cataract extraction, but da Gama Pinto thinks that even Knapp does not speak highly enough of the blessings of a successful secondary operation.

Most operators set a limit of vision below which a discission should be made (Schweigger V. $\frac{1}{4}$. Dufour V. $\frac{2}{5}$. etc.) white Panas would let the patient's individual wishes or necessities decide the question: the author would combine the two factors. Knapp however says it is the physician's duty to operate whenever he can benefit the vision without the risk of great injury. The author goes still farther. and would operate in many cases for preventive reasons—to avoid a future untransparency of the capsule.

Naturally poor patients in Portugal (and elsewhere) wish an operation done once for all. after they have at last decided to be operated upon: even well-to-do patients are discouraged at the idea of subsequent dimness of vision. and consequently the author is inclined to attack all eyes before dismissal from the hospital. except. of course.

those in which the capsule has already been lacerated. A Bowman's needle is preferred, with a crucical incision. Forceps or other methods are not liked except in extraordinarily favorable cases, although de Wecker's scissors are not rejected.

. Da Gama Pinto has finally selected as best of all a straight, small Graefe's knife, and he operates by artificial light projected through a lens. The patient sits upon a stool, his head being held in the lap of the assistant, who at the same time controls the illumination. Atropin is always used. The knife is introduced 2 mm. from the corneal margin, pushed to the opposite edge of the pupil where the capsule is then pierced and cut by a sawing motion, care being taken that the corneal wound is not so enlarged that aqueous escapes. On the withdrawal of the knife, aqueous may escape—although this is of slight moment—or vitreous, which is undesirable. The author prefers, to Knapp's method of cutting in the direction of least resistance, his own method of cutting perpendicularly to the greatest tension in the capsule, because in this way the capsule is held open by it own forces, and if aqueous escapes, there is little chance of adhesion between the edges of the incised capsule. On the third or fourth day the bandage is omitted and glasses selected.

Vitreous prolapse and incarceration in the wound are unfortunate accidents, the latter being at times mistaken for cortical fragments, a condition that seldom occurs, according to the author. When vitreous is caught in the wound, it causes severe irritation and retards recovery, so that it must be cut off by scissors close to the cornea. In fact, the author thinks that vitreous often becomes attached to the cornea and prevents a proper pupillary activity, the trouble seeming to be due to the iris. Focal illumination may often reveal the trouble—all this proves that discission is not without its dangers. Any subsequent infection is to be ascribed rather to the condition of the conjunctival sac than to uncleanliness during the operation itself.

The author does not agree with Pagenstecher in his opinion that the decission wound should be placed in the sclero-corneal margin, because, if the cornea were such a dangerous field, the modern inclination to operate exclusively in corneal tissue, would be illogical. The author prefers to consider the danger as due to irritation of vitreous, rather than to sensitiveness of cornea. Assuming the danger, however, and wishing to avoid it if possible, the author has modified his own method to what he calls posterior discission. The patient sits on a stool with head resting against the chest of an assistant; focal illumination is used. The bulbus is turned by fixation forceps so as to bring the point of entrance clearly into view. Graefe's knife is entered 6 to 8 mm. from corneal edge, the blade lying in a meridian. the point directed toward the center of the eye ball. Even if the ciliary muscle is injured it is no great misfortune. As soon as the point is supposed to have passed the ciliary muscle. it is directed toward the corresponding edge of the pupil. and is made to pierce the capsule from behind forward. The point is then pushed on, parallel to the capsular surface, to the opposite edge of the pupil and made again to pass through the capsule, this time from before backward. and the operation is completed by incising the capsule by several sawing movements. The knife must be extracted along its same path of entrance. Prolapse of vitreous is harmless, because the stretched conjunctiva closes the wound and prevents infection. (A Graefe knife, smaller than the usual size, is advised.)

Da Gama Pinto has operated with this method 133 times, most of them being on eyes not previously iridectomized. The capsule wound gapes well and persistantly, and seems to be thoroughly satisfactory. Complications have been very seldom, suppuration not at all, and all symptoms have subsided under atropin, heat, etc. Nothing original is claimed for this method, although the author takes pride in the thorough system to which he has developed it. He operates early, in many cases at the beginning of the fourth week—never however till all irritation has subsided. In the 133 above cases of posterior discission, 95 were improved in vision, 7 harmed, and 31 not affected. The author has had 3 cases of glaucoma after anterior discission. and 3 also after the posterior method.

A. B. H.

Retinal Cyst, with Hypertrophy of Connective Tissue; Resembling a Tumor.

A. A. MEISLING (Copenhagen) reports in the *Klinische Monatsblatter fur Augenheilkunde*. September, 1896, the following case: The patient, a woman. had suffered for years with eye trouble, leading to Glaucoma, etc. The right eye, long since blind, suddenly began to be painful. and to atrophy, so that enucleation was advised and permitted. On section there was found a tumor, with open spaces within it; this tumor was adherent to the lens. ciliary processes, optic papilla and adjacent sclera. Its substance was that of connective tissue, its color yellowish. The cysts (or multilobular cyst) were lined by a visible membrane, containing a yellowish syrupy fluid. One's suspicion would point to a fibro-sarcoma, probably, but microscopical examination clearly indicates here a retinal connective tissue cyst. A. B. H.

Chorio-retinitis Striata and Spontaneous Cure of Prolapse of the Retina.

Dr. Alexander Natanson, of Moscow, discusses (*Monatsblater fur Augenheilkunde*. October, 1896) this term chorio-retinitis striata proposed by Caspar (Helmholtz Festschrift, Stuttgart, 1891), and adds one more case to the four already published.

Natanson thinks the type a constant one, and in his patient, a laborer whose left eye had been bad but not painful for 20 years, the fundus appearance was as follows: The lens was clear, but there was an opaque, movable body within the vitreous cavity. On closer inspection under atropin, two distinct white bands were discovered. passing in either direction from the papilla horizontally. Around the disc and following these white bands were atrophic areas not unlike those seen in pigment degeneration of the retina. There were other similar striations in the lower part of the fundus. Above the fundus the retina was normal; below, the retina was pigmented. of a different color, somewhat like retinitis pigmentosa (evidently poorly nourished and probably loosely attached). There was vision from the upper part of the retina, none from the lower. The reporter thinks it a proof of the theory that chorio-retinitis striata indicates reposition of a detached retina, the white bands being the product of organized fibrous clots. A. B. H.

Exenteratio Bulbi, with the Use of an Artificial Globe,

is discussed by Dr. H. Schmidt, of Aachen (*Klinische Monatsblatter fur Augenheilkunde*, November, 1896). After reviewing the literature of the subject and giving credit to both Kuhut and Mules for their work, he reports five cases operated on by him with the following results: In three cases the globe remained without irritation for 4¼, 5 and 3⅓ years (up to death): in two cases the globe was expelled after ¼ year and 2½ years.

The first failure is ascribed to an unusually thin sclera; the second to a fall on the head two years after the operation, which possibly caused direct trauma to the artificial eye. The author is very encouraged with his results, and thinks the operation has a permanent place in surgery, especially when the increased naturalness of an artificial eye is considered, but he adds some suggestions as to modifications of the original technique, as follows: The scleral pouch must be nearly spherical, and to accomplish this, it is best, after excision of the cornea, to make four oblique incisions into the scleral tissue, each 7 mm. long, and on completing the operation to suture together the two horizontal flaps thus formed, above them suturing the remaining perpendicular flaps. The relative insertions and movements of the recti muscles are thus more naturally retained. Again, the artificial vitreous must be contained in a scleral pouch which remains permanently closed. To accomplish this, the author sutures the sclera very carefully by itself, closing the conjunction above it by independent sutures, all of which must be of absorbable catgut, never of silver or of silk. Finally, the contents of the sclera must be thoroughly removed, but not with force: after the scoop has once been used to withdraw the vitreous and other tissues, it is much better to use gauze for seizing fragments of ciliary body and choroid.

Schmidt thinks there can be no danger from sympathetic ophthalmia if all steps of the operation are done under aseptic precautions, and if the end branches of ciliary nerves are carefully and without irritation removed.

A. B. H.

[The editor calls attention in a review to other favorable reports on evisceration, one by L. Webster Fox, in the *Medical Bulletin*, Vol. XVII., No. 6, page 211, the other a paper read by Thomas H. Bickerton before the British Medical Association in 1896, and published in the *British Medical Journal* of September 26, 1896, page 813. Both of these operations obtained good results by "Mules' Operation" and are sure that the method has won a permanent place in eye surgery.] A. A. H.

PROFESSOR SCHOELER, in a letter to the *Klinische Monatsblatter fur Augenheilkunde* for November, 1896, suggests a new method for making a scleral incision preliminary to the performance of an iridectomy, applicable especially in cases of shallow anterior chamber, or of an opaque leucomatous cornea, or when the hand of the operator cannot control the keratome or knife so as to prevent escape of aqueous or injury to the iris. Professor Schoeler scarifies the sclera along the line of the intended wound, making it as long as may be necessary: when the sclera has been severed, any prolapse of iris may be gently replaced until the wound is extensive enough (a large wound in acute glaucoma, for example), and thereafter the iridectomy can be carried out as usual. A. B. H.

ABSTRACTS FROM RECENT FRENCH AND ITALIAN OPHTHALMOLOGICAL LITERATURE.

By Casey A. Wood, M. D.,

CHICAGO.

An Operation for Adherent Secondary Cataract by Combined Anterior and Posterior Incisions.—Subcutaneous Injections of Calomel in Syphilitic Lesions of the Eye.—Gunshot Wounds of the Eyeball.—Heredo-Syphilitic Diseases of the Eye in the Second Generation.—The Dyschromatopsia of Hysteria.—The Ocular Symptoms in Erbis Diseases.

An Operation for Adherent Secondary Cataract by Combined Anterior and Posterior Incisions.

In a previous paper Galezowski* analyzed the different varieties of secondary cataract and sought to demonstrate that each variety demands an operative procedure of its own and contended that it is irrational to apply the same remedial measure to each of these different forms of the disease. When one has to deal with secondary membranous cataract one is tempted to consider it as one of the usual postoperative but simple complications of cataract extraction, and that it can easily be cured by simple needling. This is, however, not always the case. It is always well to remember that the dragging upon the zonula of Zinn may tear it, may provoke hemorrhages from the ciliary regions, may set up cyclitis, etc. To avoid complications, both immediate and remote, one should apply a surgical procedure appropriate to the variety of cataract under consideration. In non-adherent secondary cataract simple discision will usually succeed very well. But it occasionally happens that capsular cataract is not as easily divided as appearances seem to indicate, and the attempt at discision, with the ordinary instruments for that purpose, terminate in failure. The vigorous pulling exercized, by the single needle upon the capsule may, for ex-

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*De l'operation des cataractes secondaries adhérentes par l'incision d'arrière en avant. *Recueil d'ophtalmologie*, Oct., 1896, p. 587.

ample, be followed by iritis or irido-choroiditis. Again, a successful incision of the cataract may be made, however large it has been, may close in a few days, or even in a few hours, and leave the case as bad as ever. In view of these facts Galezowski resolved some time ago to modify his first method of discision and employ a new one by means of two crescentic needles, one almost straight and the other curved.

Fig. 1.

1. *Process of dividing from before backward by means of two sickle-shaped needles.*

The eye to be operated on is fixed by means of a fixation forceps in the hand of an assistant. Holding my curved needle in the left hand I transfix the cornea three millimetres from its border. After pushing the needle into the anterior chamber I carry it through the capsule very near the pupillary border and reënter the anterior chamber on the opposite side at the point *c*. Fig. 2.

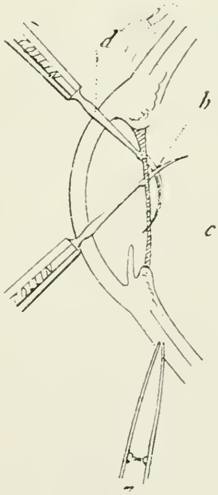

Fig. 2.

The cataract being firmly fixed in this manner, I penetrate the cornea at its opposite border by my straight needle held in the right hand. Transfixing the capsule near the pupillary border at the point *b*, I press the two needles one against the other, and by a saw-like movement of the straight needle divide the capsule from before backward in such a manner as to produce no traction or tearing of the ciliary body.

2. *Second method of division from behind forward, of capsular cataract, by means of two needle knives.*

The above process is employed in secondary cataract where the capsule is further thickened by the remains of cortical substance or plastic exudation, with total occlusion of the pupil, and where there are adhesions, either partial or complete, with the iris. One knife will sometimes suffice, but in other cases the two knives must be used, one to fix the cataract, the other to make the incision. In using a single curved knife, it is carried through the capsule and back into the anterior chamber, at the opposite border of the former, near the pupillary margin, cutting upward, or from behind forward, by a sawing movement. When two curved knives are employed, the one in the left hand is passed into the anterior chamber and its curved surface is pressed against the anterior surface of the cataract, to fix it, while the other knife is manipulated in the same manner as described above. (See

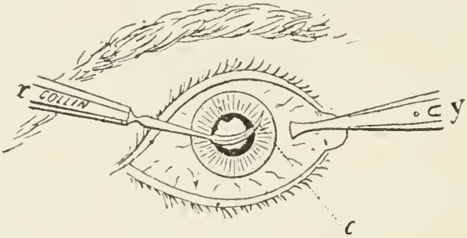

Fig. 3.

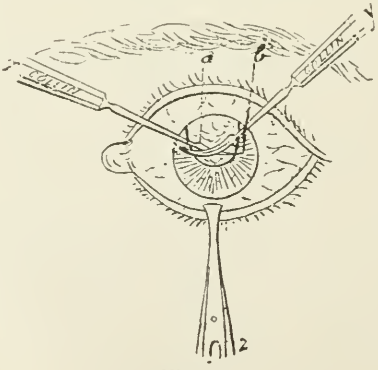

Fig. 4.

Figs. 4 and 5.) Should this not give an opening of sufficient size. reintroduce the knives, without hesitation, and cut in the direction diametrically opposite.

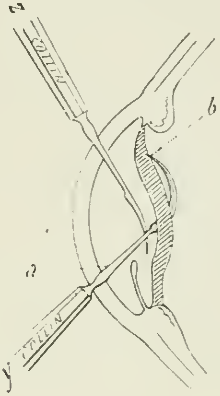

Fig. 5.

In conclusion it may be said:

1. That in non-adherent secondary cataracts a simple discission, with a sickle-shaped knife-needle. cutting from behind forward, may suffice.

2. In adherent cataracts the division should be made with the two needles, one fixing the cataract and the other cutting from behind forward.

3. If the adhesions are very extensive and the iris atrophied, the incision should be extended even into the iris itself.

Subcutaneous Injection of Calomel in Syphilitic Lesions of the Eye.

The propriety and therapeutic value of mercurial injections in syphilis generally—including the ocular manifestations of the disease—have, for several months, been discussed by the French Dermatological Society.

Asselbergs* reports that while some specialists still rely upon *soluble injections*—bichloride, biniodide and cyanide of mercury the majority recognize the superiority of *insoluble injections*, *e. g.*. gray oil *(L'huile grise)* and calomel mixtures—preference being given to calomel. Gray oil is less painful; calomel more efficacious.

The dose of calomel employed is from 0.05 to 0.10 grm. The excipient is olive oil sterilized by prolonged boiling:

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*Des injections de calomel dans la syphilis. *La Presse médicale belge*, 15 Nov.. 1896.

one cubic centimeter of the oil to 0.05 grm. of calomel. The preparation should be freshly made at the time of using, owing to the unstability of the mixture. The syringe employed should be sterilized. The injection is made deeply into the muscular tissue of the gluteal region, after careful disinfection of the skin. It may be given at the surgeon's office, and should be repeated every 8-10 days on an average.

The first and principal objection to this method of treatment is the pain. This is largely overcome by injecting the mixture deep into the muscle.

The pain usually begins on the second day, is violent on the fourth, very active on the fifth, lessens on the sixth and disappears on the eighth. The second objection, that may be urged, is that nodules are produced in one-third of the cases. These are rarely painful and disappear in from 10-15 days.

The third and most grave objection is the possibility of abscesses; but in these days of asepsis and antisepsis such an occurrence should be rare.

What are the advantages of the method?

1. Exact dosage and safety.
2. Facility and secrecy.
3. Non-disturbance of digestion.
4. Powerful curative action.

The forms of syphilis in which injections of calomel have appeared to have the greatest curative action are: (1) Certain syphilides of the skin and mucous membrane, erosions of the tongue, digits-palmar fissures, palmar and planter psoriasis, etc.; (2) Syphilitic ulcers in general and especially ulcerations of the tongue and (3) *Ocular* and *cerebral* complications.

The following conclusions are claimed by the writer to be generally accepted:

a. The deep injection of calomel is a powerful agent in the treatment of syphilis.

b. It cannot be made a treatment that will apply to all cases.

c. It will be reserved for those cases where quick action is all important; where the trouble threatens an organ of great functional importance—the brain, *the eye*, the larynx and the viscera.

d. It is indicated in all troubles that do not respond to other forms of treatment.

e. It is a satisfactory remedy in neglected cases; in cases of intolerance to internal treatment; in cases of irritable skin, and in cases where the patient fears to be compromised by pills and frictions.

Gunshot Wounds of the Eyeball.

Valois[*] asserts that, in his experience, shot are among the most frequent of the foreign bodies that by accident penetrate the eyeball. They may enter the globe directly from the gun, or indirectly, after having passed through, or glanced from some other foreign body. Wounds received from direct shot are less apt to give trouble than those received indirectly, because in the latter instance, they may be infected from contact with the reflected body, or the shot may be flattened and so inflict an irregular wound, a condition of things that materially increase the chances for infection after the accident.

It is not believed that shot produces the slightest inflammatory action by virtue of any chemical properties of lead; although the vitreous promptly resents the presence of all foreign bodies, it is to be remembered that a shot is tolerated much better than any other extraneous substance.

Heredo-syphilitic Disease of the Eye in the Second Generation.

Strzeminski[†] gives an interesting account of these lesions, drawing attention to the fact that Galezowski had also studied them some years before.

He has had under observation two well marked cases during the past three years. Both were children of a father who gives a history and furnished all evidence of hereditary syphilis in the first generation. The mother is absolutely free from taint, hereditary or acquired.

The older child, a boy of 12 years, developed bilateral interstitial keratitis. After five months' treatment by mercurial inunctions, atropine and yellow ointment, the corneæ cleared but vision remained unimproved. Examination of the fundi revealed the following lesions:

In the right eye, numerous dust-like and filiform opacities of the virtreous, especially in the posterior and inferior region. The papilla and surrounding region were of a grayish tint. In the macular region were seen little, round, yellow and rose-colored spots with pigmented borders. Toward the equator there were numerous clear, rose-colored spots beneath the retinal vessels. Vision is only $\frac{2}{10}$; field of normal size but presents many scotomata.

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[*] Blessures de l'œil par grains de plomb. *Recueil d'ophtalmologie*, p. 577, October, 1896.

[†] Maladies heredo-syphilitiques des yeux à la deuxième génération. *Recueil d'ophtalmologie*, Oct., 1896. p. 602.

The left eye presented conditions similiar to the right but in a less degree. Vision was $\frac{5}{10}$. Antisyphilitic treatment was continued with the effect, in $2\frac{1}{2}$ months, of dissipating the opacities in the vitreous body and restoring the acuteness of vision to normal.

The sister of the above, aged 9, had until the above age enjoyed perfect eyesight. She now began to complain of a trouble which progressed until only simple perception of light remained. Upon examination it was found that thick opacities of the vitreous rendered it impossible to see the fundus. Keeping in mind the history of the patient's father and brother, diagnosis of choroiditis, heredo-syphilitic in character, was made. After 20 inunctions of mercury, the fundus could be examined. After 95 inunctions, extended over a period of 5 months, the opacities had almost disappeared and the vision had been restored to $\frac{6}{10}$. The author believes that his examination of the cases and the result of treatment have conclusively proved them to be heredo-syphilitics of the second generation; that the father had hereditary and not acquired syphilis, that the children suffered from eye troubles in every way similiar to those provoked by acquired syphilis, as syphilis of the first generation, and that all other causes of diseases in children had been excluded and, finally, the incontestable results of the mercurial treatment testify to the syphilitic nature of the trouble.

The Dyschromatopsia of Hysteria.

Péchin* thinks that if the color field of hysterical patients be considered as normal, presenting the dimensions in which one knows them in the normal eye, achromatopsia and dyschromatopsia are but poorly explained by a *concentric contraction* of the field of vision. This, however, is the theory around which J. M. Charcot, Sandolt and, more recently, Gilles de la Tourette, in his work on the *Treatment of Hysteria*, have rallied. The theory, however,

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*De la dyschromatopsie chez les hystériques. *Recueil d'ophtalmologie*, p. 599, 1896.

is far from explaining all cases. When the disorders of the colored vision begin with the most central colors, approaching nearer and nearer the peripheral ones, and the color fields diminish in the regular order of their physiological succession, where one has to do with the *blue series* cases, so called because blue is the last color to disappear—the theory of *concentric contraction* holds good. But there is also a *red series*—cases in which red may persist when yellow or blue is no longer appreciable. In the last normal cases the theory *concentric contraction* is faulty, or rather, it is correct only by regarding the colored visual field as inverted.

According to Knies the lesion which determines the amblyopia has to do with some cerebral disturbance—vaso-motor innervation localized at the optic foramen.

Influenced by the vaso-motors the sheath of the optic nerve is compressed from vascular dilatation to such extent as to *inhibit* the conductibility of the nerve fibres without *destroying* them. The almost immediate restoration of function is in this manner explained as is also the cure of certain cases by mental suggestion.

Knies has also established an analogy between disturbances of vision in unilateral amblyopia and those of hysteria.

The Occular Symptoms in Erb's Disease. *

This symptom—complex, first clearly described by Erb in 1878, and further elucidated by Goldflam, consists essentially of signs due to disturbances in the external oculomotor apparatus. At first paresis or paralysis of the muscles governed by the cranial are noticed, and at last the extremities suffer. But that which specially characterizes this disease are the marked variations in its course from day to day. In its early stages muscular exhaustion is readily brought on, and it may happen that at one examination movements may be quite normal, but a little later in the day they may indicate fatigue that deepens into absolute loss of function.

So far as the eyes are concerned, in the 22 cases described, paresis or paralysis of the levatores palpebral superioris have been observed, together with interference, more or less marked, with the innervation of the extrinsic ocular muscles—sometimes on one side, sometimes on both sides.

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* Abridged from Lodato's review of Professor Grocco's article (*Della malattia di Erb o di Erb e Goldflam*) in the August 30th, 1896, issue of the *Archivio Italiano di Clinica Medica* and published in the *Archivio di Ottalmologia*, September–October, 1896, p. 135.

Autopsies, where these could be obtained, threw no light upon the cause of the symptoms.

Grocco had the good fortune to study two examples of this rare disease and he makes a few observations regarding them that seem worthy of publication. The first of these is the early fatigue of the constrictor fibres of the iris under the stimulus of light. When exposed to a moderate light for a time. the pupils at first respond normally. but, after a while, they begin to widen and finally remain immovable in a condition of medium dilatation.

The second observation of this disease that Grocco has added to those already comprised in the classic list of Erb and Goldflam is, that in one eye there may be many of the signs known to be proper to Basedow's disease (exophthalmus, Graefe's sign, Stellwag's sign), while the other one may show only Graefe's sign—both without lachycardia or goitre.

In this latter connection the author refers to certain atropical cases of Graves' disease described in literature that were accompanied by paresis of the extrinsic ocular muscles. weakness of the extremities, and variable ability to speak, masticate and swallow. These, he suspects. are really examples of the Erb-Goldflam disease, and suggests that when, with a transient or variable ophthalmoplegia there is associated easy fatigue of other muscles of the body. with no decided evidences of organic lesion. One's suspicion ought to be aroused of the presence of the Erb-Goldflam symtom-complex.

NOTES AND ANNOUNCEMENTS.

(The ANNALS will be pleased to publish, under this heading, items of interest to its readers. Address Dr. Casey A. Wood, 103 East Adams Street, Chicago.)

Dr. Horace Bonner has moved to 119 S. Ludlow St., Dayton, O.

Dr. Wendell Reber has left Pottsville and taken up his residence in Philadelphia, No. 1208 Spruce street.

We regret to learn that Dr. N. C. Scott is in ill health. He contemplates a trip to Mexico to recuperate.

Owing to continued illness Dr. T. E. Murrell has decided to leave St. Louis and reside in Denver.

Dr. H. V. Würdemann has removed his office to 128 Wisconsin St., Milwaukee, Wis.

Dr. Chas. W. Root, who has been associated for two years with Dr. Würdemann, of Milwaukee, has gone to Philadelphia.

Dr. J. W. Sherer, of Philadelphia, will be associated with Dr. Würdemann after January 15th, 1897.

Dr. Albert B. Hale has moved to No. 69 Twenty-second street, Chicago.

Dr. H. Frank Fisher has changed his location from Nashville, Tenn., to Kansas City, Mo.

Dr. Wm. F. Southard has been appointed Professor of Ophthalmology and Otology in the College of Physicians and Surgeons of San Francisco.

We clip the three following items from the last number of the *Archives of Ophthalmology:*

Dr. Mellinger has been appointed professor of ophthalmology in ordinary in the University of Basel, to succeed Prof. Schiess-Gemuseus, resigned.

Dr. Bjerrum has been appointed professor of ophthalmology, in ordinary at the University of Copenhagen, in place of Prof. Hansen-Grut, resigned.

Dr. Th. Sachs, oculist and Privatdocent in Innsbruck, is dead. He was the author of a number of very valuable papers, of which we specially mention one entitled: Anatomical and Clinical Contributions to the Knowledge of Central Scotoma in Affections of the Optic Nerve, in Vol. XVIII., p. 133, of the *Archives.*

Dr. Gregory A. Wall has been obliged, owing to an incipient lung affection, to relinquish practice in Topeka, Kas., and remove to Albuquerque, New Mexico.

Owing to the amount of composition in the annual index to Vol. V., the publisher is unable to issue it this month, but same will appear with the February edition.

The Western Ophthalmological, Otological, Laryngological and Rhinological Association meets in St. Louis on the first Thursday and Friday of April, 1897. Physicians desiring to read papers will please send titles to secretary, Dr. Hal. Foster, Kansas City, Mo. Programs will be mailed Feb. 1, 1897.

Although the motto of the Annals is, if anything, *acta non verba*, its editors may be excused if they entertain a feeling of pride at having their effects referred to in the flattering terms made use of by the *British Medical Journal* in a recent issue. The periodical in question is not in the habit of indulging in mere flattery, and the staff of the Annals is not likely to be spoiled thereby.

We learn that the name Midland Ophthalmological Society has been given to the association of local ophthalmologists whose intention it is to meet once a month at the Wisconsin Building, Kansas City. It is intended to have two meetings a year, when members of the profession are to be invited from neighboring States.

The October number of the *Refractionist* contains the following announcement: The present number of the *Refractionist* is late in appearing. The next number (No. 8) issued, will be in December. November will be omitted. The remaining four numbers of Vol. III. will be issued quarterly during 1897, in March, June, September and December. Subscriptions for this volume will not expire till January 1, 1898. After that date it will continue to appear quarterly.

We understand that the publishing and editorial offices of the *Ophthalmic Record* have been removed to Chicago, and that it will continue to be issued as a monthly under an entirely new management. Dr. Savage will contribute to it in common with a number of Ophthalmologists in other parts of the continent. Monthly ophthalmic journals have hitherto not been a shining success in America, and it remains to be seen whether the *Record* will be an exception to the rule.

Dr. Chas. A. Oliver's small but valuable "Description of Some of the most Important Ophthalmic Methods Employed for the Recognition of Peripheral and Central Nerve Disease" is dedicated to Dr. Weir Mitchell. Although intended chiefly for the general practitioner and the neurologist, it may, with profit, be studied by the ophthalmologist who does not feel fully posted in the methods of neurophthalmic examination. This monograph has already been translated into French by Prof. Baudry, of the Univessity of Lille, and will be published early in the year.

Prophets Not Without Honor.

When Crown Prince Prederick of Germany was suffering from cancer of the throat he sent to England for a laryngologist; when the Czar of Russia was ill he had his own physician, but sent to Berlin for a consultant; and now Queen Victoria is suffering from failing vision, and has sent to Germany for an oculist, Dr. Pagenstecher, of Wiesbaden, to examine her eyes. The *Medical Times* says that there is a pamphlet in circulation in which many of the leading oculists of England are spoken of in disparaging tones, and it is intimated that the Queen was influenced by that to send abroad for advice.—*The Medical Record.*

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Dr. E. H. Pardee died, September 22d, at his residence in Oakland. For the past four or five years he did but little professional work on account of failing health. During the last ten or twelve months he was a great sufferer, being confined most of the time to his room. He lived in Oakland for more than 30 years, and was once its mayor and for years was a leader in politics in Alameda county. He was a firm believer in the future of Oakland, showing his faith by investing largely in real estate and building a large block on Broadway. He treated diseases of the eye and ear in San Francisco for many years, being, in fact, one of the pioneers of this branch of medicine on this coast.—*Pacific Med. Journal.*

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In the *Gazeta Medica de Mexico* (Oct. 15, 1896, No. 20) there is published an article by Dr. Montaño on the Mathematics of Visual Acuity. It seems that there were two candidates for the National Academy of Medicine, both wishing to be elected to a vacant membership in the Ophthalmological section. The academy appointed a committee of three to select the more worthy of the competitors' theses. The committee unanimously recommended the appointment of both candidates to the academy, but a majority selected Dr. Montaño as the successful one for the ophthalmological section, because his thesis treated of a subject as a matter of pure science, and it was therefore considered by them of a higher order than the thesis of Dr. Chanez, who chose for his subject the History and Performance of Enucleation. A minority of the committee reported in favor of Dr. Chanez, because—although the reasoning of the majority was acknowledged good—it was held that on a percentage basis of error Dr. Chanez' thesis was less faulty.

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As will be seen by the Announcements on the cover of this number it has been decided to issue the ANNALS OF OPHTHALMOLOGY AND OTOLOGY in two portions, the ANNALS OF OPHTHALMOLOGY as usual in January, April, July and October, and the ANNALS OF OTOLOGY (including Rhinology and Laryngology), during the succeding months of February, May, August and November. It is believed that such an arrangement is to the best interests of all concerned, and we assure our readers that no trouble or expense will be spared to retain the enviable position that the combined periodical has in the past attained. Notwithstanding the vast amount of literature made accessible to the profession by the pages of the ANNALS during the past year (more than double that of any similar journal or journals) the low subscription will be maintained during 1897. It is hoped that every subscriber to the ANNALS will show his appreciation of the "labor of love" that has been expended upon this American enterprise, and will give it his help in every sense of the word.

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The following circular letter is self-explanatory: We are sure that every reader of the ANNALS will feel regret that so valuable a source of information, as the English edition of the *Annales d'Oculistique* had proven under Dr. Stevens' able management, should come to so untimely an end.

33 West Thirty-third St., New York, Nov. 6, 1896. Dear Doctor: In January, 1895, in the belief that the *Annales d'Oculistique*, through a provisional agreement prepared by the editors of that journal, was to be edited as a periodical in two editions, in which there was to be a unity of interest, I undertook, at an expense of much labor and means, the direction of the edition in English. Interpretations were soon placed upon the agreement which I could not

possibly accept nor even consider. These interpretations were such as to be absolutely incompatible with any unity of action or interest and fatal to the hope of any fulfillment of the promise to make the journal international. After much delay and with earnest efforts in the hope of a better outcome, I am compelled, with sincere regret, to announce that, in justice to the subscribers to the edition in English, to its contributors and to myself, I have declined to continue to conduct it under existing conditions. Seven numbers of the current year have been issued, including one full volume. Enclosed you will find a check for the amount of your subscription less the proportion for the completed volume. I am very truly yours, George T. Stevens.

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The British Law as to Unqualified Oculists and Aurists.—An interesting decision was rendered by the stipendiary magistrate at Leeds, Eng., Sept. 1, 1896, according to a report in the *Law Times* in a case wherein complaint had been made by the British Medical Defense Union that a Mr. Thomas Ison had falsely described himself to be an oculist and aurist, implying that he was registered as a medical practitioner under the Medical Act; and, moreover, that he had held himself out to the public to be by profession a surgeon under one of the provision of that act. The magistrate dismissed the first part of the charges. He said that the informant, the general secretary of the above society, had admitted on cross-examination, that he had never known a qualified medical practitioner describe himself simply as an "oculist and aurist," those terms being generally used by persons whom he designates as "quacks." This, in the magistrate's opinion, destroyed the whole fabric of the informant's case so far as the first point at issue was concerned. Nor did the magistrate think that the fact that the defendant called his place "The Leeds Eye and Ear Dispensary," was a representation that he possessed a legal qualification, as a surgeon, but only that he was an optician by trade, or an unqualified practitioner in the treatment of the eye and ear. But Ison had affixed on a wall in the public street a placard on which, under the arms of the city, were printed the words, "Leeds Eye and Ear Dispensary, Established 1871, 52 Great George Street, Mr. T. Ison, Oculist and Aurist," and on an inner door at Great George Street there was inscribed, "Consulting Oculist and Aurist." Furthermore, Ison quoted in his advertisements from paragraphs which had appeared in the newspapers in praise of a previously existing charitable eye and ear infirmary. The inference the magistrate irresistably drew from these circumstances was that the "Leeds Eye and Ear Dispensary" was a recognized medical institution, and that the defendant himself was a recognized medical practitioner who had no regard for the unwritten law of the profession as to advertising, which, after all, the magistrate said, was a mere convention of no obligation—a rule of etiquette. Except for the references in the newspapers and on the walls to the "Leeds Eye and Ear Dispensary," he should probably have dismissed this second point in the case also; but, with a view to the guidance of the defendant in the future, the magistrate imposed a fine of five pounds sterling and costs.—*Journal A. M. A.*, Dec. 26, 1896.

BOOK NOTICES.

Ocular Electrotherapy.

(A translation from a recent number of *La Clinique Ophtalmologique* of Dr. Pansier's *Traité d' Eléctrothérapie Oculaire.)*

After witnessing the numerous and marvelous results which electricity has brought about in the hand of the general practitioner we cannot be surprised to see the oculist attempt its employment in the treatment of ocular diseases, and since the happy results which they in turn have derived from it, books and pamphlets have come to our notice. More recently, the work of Dr. Pansier will be found a complete and interesting work on the subject. The work is written for the student as well as for the graduate, giving full directions as to the use of the agent, the kind of current, how, where and when used. The author, having fully appreciated the intimate relations existing between certain organic troubles and the eye, describes them, as well as the apparatus and modes of treatment. Considerable attention is also given to ocular physiology. The marked action of the sympathetic under all possible conditions is treated at length and with scientific accuracy.

The lengthy study of Boucheron on "Phosphenes" is commented upon, and a table is given illustrating the different reactions obtained on opening and closing the current, by placing the poles successively upon the following regions: middle of the forehead, left temple, under the orbit, at the root of the teeth of the inferior maxilla, etc. Its purpose in diagnosis and its attendant dangers are, no doubt, worthy of the space allowed them. This complete treatise is recommended to the profession. BEAUDOUX.

A System of Diseases of the Eye.

By American, British, Dutch, German and Spanish authors. Edited by Wm. F. Norris, A. M., M. D., Charles A. Oliver, A. M., M. D., Vol. I. Embryology, Anatomy and Physiology of the Eye, with 23 full page plates and 362 text illustrations. Philadelphia: J. B. Lippincott Co. 1897. To be complete in four handsome imperial octavo volumes of about 600 pages each. Price per volume, cloth, $5.00; full sheep, $6.00; half Russia, $6.50.

American ophthalmologists should be proud of the fact that the first system of Diseases of the Eye printed in English has been edited by their own countrymen and published by an American printing house. At last we have a work that will favorably compare with the Graefe-Saemisch *Handbuch der gesammten Augenheilkunde* and the de Wecker-Landolt *Traité complet d'ophtalmologie*. It is appropriate that Dr. Edward Jackson should write the chapter on the Dioptrics of the Eye, and that Normal Color Perception should be presented by Dr. William Thomson.

The opening chapter, on the Develpment of the Eye, is a posthumous contribution, we regret to say, inasmuch as the talented author, Dr. John A. Ryder, of Philadelphia, did not live to see his article in print. His work stands as a monument to his patient industry and to the successful treatment of the subject. The illustrations of his article, like those inserted in the text elsewhere, are unusually good and serve to elucidate a subject that is not clear to every student. We have not space to enumerate all the additions that have been recently made to our knowledge of the anatomy of the eye-ball and its appendages, but would draw particular attention to the description given by Dwight (pp. 93 and 109) of the capsule of Tenon.

"It is taught as by common consent that the capsule of Tenon is a socket in which the eye-ball rotates without change of position, except, perhaps, that under certain circumstances it may move a minute distance forward or backward. Anatomy shows that this is impossible. It is easy to see that as Tenon's capsule is closely attached to the globe near the cornea, it is out of the question that the former should stand still while the latter moves in it. Undoubtedly the two move together on the cushion of fat behind them, and perhaps some slight motion may occur between them. The muscles pierce or, more properly, invaginate this membrane."

Dr. Frank Baker, of the Universisity of Georgetown, writes the essay on the Anatomy of the Eye-ball and the Intraorbital portion of the Optic Nerve and gives a very complete and well written study of the subject. His chapter on the iris is well worth reading. He believes that Leber's theory is correct when he states that the only well established channel for the exit of fluids from the eye is that at the irido-scleral angle, and that a very small amount, if any, leaves by way of the optic nerve.

Microscopical Anatomy is presented in an interesting manner by Dr. George A. Piersol and he occupies 165 pages in his treatment of this subject. Probably this monograph presents a greater contrast with the corresponding subject treated of in the French and German "systems" than does any other in this first volume.

The Anatomy of the Cerebral Portion of the Visual Apparatus, by Dr. Alexander Hill, of Cambridge, England, is next in order. Reviewing the various kinds of evidence presented by anatomical considerations, pathological changes and direct experiments on animals the author concludes that there is considerable uncertainty both as to the exact topography of the visual area and as to the nature of the processes that are carried on within it. We have gotten no further than the classic case reported by Henschen and must regard cortical vision as residing, in man and in monkeys, within the "domain of the calcarine fissure," as von Monakow puts it.

Mr. William Lang writes, with Mr. Treacher Collins, the chapters on Congenital Malformations and Abnormalities. The reviewer well remembers a study, made with Mr. Lang, of Coloboma of the Iris, and it is to be noticed that he repudiates the idea that this defect is always due to an unclosed fœtal fissure. "The iris is not developed in two sectors, and the normal fœtal iris never has any cleft: it grows as a prolongation forward from the ciliary body—not, however, commencing until the two edges of the fœtal fissure in that structure and in the choroid have become united. Should the cleft in the ciliary body remain unclosed, or should the closure be delayed, then either no iris would be formed in the position of the cleft, or the time for the development of the iris in that position would be shortened, and it would not attain its normal length.

To this explanation it may be objected that it is difficult to see why the defect should sometimes be situated in the upper part of the iris, the fœtal cleft being below. Pflüger suggested that in these cases some rotation of the eye occurred during fœtal life.

Makrocki supposes the choroidal fissure to be abnormally placed.

Neither of these hypotheses would explain the existence of the colobomata in one eye, or of a horizontal coloboma of the iris with the same defect in the choroid at right angles to it.

It has been suggested that irideremia is due to an abnormal adhesion or late separation of the lens and cornea. Should this adhesion or late separation, instead of involving in the cases of irideremia the whole surface of the lens, involve only a portion of its area, then the iris would be prevented from developing there, but would be formed in the normal way in the rest of its circumference. In this manner a coloboma of the iris might occur in any position, and even two might be formed in the same eye."

Too great praise cannot be given to the sensible treatment of the Dioptrics of the Eye by Dr. Edward Jackson. A difficult subject is made comparatively easy in a few pages. Although objections may be raised to the small space (as compared with the endless array of figures, diagrams and formulæ of other text books and monographs) given to this subject the omissions seem rather desirable ones.

Dr. McKeen Cattell, of Columbia College, writes upon the Perception of Light, and Dr. Eugene Brodhun upon Binocular Vision, Conflict of the Fields of Vision, Apparent and Natural Size of the Objects, etc. Chapters 12, 13 and 14, in which Professor Cattell treats of After Images, are among the most interesting in the volume. The translator of Dr. Bradhun's contribution has done her work remarkably well.

Normal Color Perception is the title of the chapter written by Dr. William Thompson, assisted by Dr. Carl Weiland. This is a scholarly presentation of the hypotheses, theories and facts relating to our perception of color.

We are pleased to see that he has not overlooked Dr. Swan Burnett's theory of color perception and does not neglect Oliver's correlation theory of the same process. Altogether these chapters form a very complete introduction to the study of color blindness, which Dr. Thomson will give us in the second volume of the System.

Dr. Carl Mays, of Heidelberg, writes on The Photo-Chemistry of the Retina—a chapter of very great interest to the student—translated by Spalding, of Portland, Me., in his usual effective style. As we read of the visible changes that occur in the retinal pigments we seem to get nearer to the essential nature of light than we do when we study the microscopical anatomy of the visual centers. But these chemical changes, brought about by the so-called "irritations," as well as the electrical processes assumed to be set up in the retina by the action of light, merely carry us back a step or two toward that mysterious and elusive manifestation, whatever its nature may be, that issues in light, color and form perception.

The press work, typography, paper, indexing, etc. of this admirable volume leave nothing to be desired. We look forward with pleasurable anticipation to the second volume and trust that every Englsh reading ophthalmologist will add the system to his library.

C. A. W.

Diseases of the Eye.

A Handbook of Ophthalmic Practice for Students and Practitioners., by G. E. de Schweinitz, A. M., M. D. Second edition. Octavo, pp. 679. W. B. Saunders, Philadelphia, 1896.

The issue of the second edition of this American textbook on Ophthalmology, four years after the original appearance of the work, indicates that it has met with a favorable reception. It has been revised and brought up to date by the addition of paragraphs on Filamentous Keratitis, Blood-staining of the Cornea, Essential Ptisis Bulbi, Foreign Bodies in the Lens, Circinate Retinitis, Symmetrical Changes at the Macula Lutea in Infancy, Hyaline Bodies (Drüsen) in the Papilla, Monocular Diplopia, Subjunctival Injections of Germicides, Infiltration-Anesthesia, Sterilization of Collyria, Ophthalmia Nodosa, Electric Ophthalmia and Angioid Streaks in the Retina.

The chapters on General Optical Principles and on Normal and Abnormal Refraction have been revised by Dr. Edward Jackson; these had been prepared for the first edition by Dr. James Wallace.

An appendix containing a description of the method of using the ophthalmometer and the tropometer has been substituted for the bibliography of the first edition.

A careful perusal of this volume indicates that the author understands his ground thoroughly and has had much experience in teaching students, and hence appreciates their needs. His language is plain and concise and his arrangement of matter methodical. The book is not free from a very common fault in textbooks on Ophtholmology written for students and practitioners; the failure to observe the proper relationship between importance of the disease or condition discussed and the amount of space allotted; thus Anisometropia is dismissed with eleven lines, while twelve lines are given to Symmetrical Changes at the Macula Lutea, twice as many to the rare Tumors of the Cornea, and more than a page to the consideration of the Estimation of Refraction in the Indirect Method. It is probable also that a number of descriptions of very rare affections or conditions might have been omitted with advantage in a work of this scope.

We miss the account of the anatomy of the different parts of the eye, usually supplied with textbooks of this sort, and very useful, either to the student or the general practitioner, in refreshing his knowledge of the parts previous to reading the various chapters.

Proof-reading has been well done, and there are scarcely any errors in this respect. Paper, printing and binding are first-class, illustrations good, and the two chromolithographic plates, containing seven reproduced figures, are very much above the average of similar work done in this country.

The preceding lines will indicate how very little fault can be found with the work and how much there is to commend. It is a very useful, satisfactory and safe guide for the student and the practitioner, and one of the best works of this scope in the English language.

C. H. M.

The Gonorrhœal Conjunctival Diseases and Their Treatment.

KNIES, M., in Freiburg (*Die gonorrhoischen Bindehauterkrankungen und deren Behandlung*). Samml. zwangloser Abhandl. aus d. Geb. d. Augenhlkde. Herausgegeben von. Prof. A. Vossius I. 5. 1896.

The cause, symptoms, diagnosis and prognosis of gonorrhœal conjunctival diseases of the new born and adults are fully exhibited in this paper. The so-called classical method of treatment instituted by Albrecht v. Graefe is not considered proper for the practical physician. Knies uses astringent fluids instilled into the conjunctival cul-de-sac which is by these means fully cleansed. He does not consider any especial astringent of great importance, although he recommends sulphat of zinc or the sulpho-carbolat in 1/3% or 1/2%. It is to be understood that these astringents are to be used only in the second stage when the suppuration is fully established. When this treatment does not suffice, a drop of 2% nitrat of silver may be put into the eye afterward. He recommends the method of Credé for prophylaxis. The proposition to raise the temperature of the body by a hot bath of 12 hours duration of 40° C. by which the growth of the gonococcus is hindered or rendered innocuous, is certainly novel. The usual treatment has been to hinder their growth by ice compresses.

H. V. W.

Ophthalmic Operations as Practiced on Animals' Eyes.

By CLARENCE A. VEASEY, A. M., M. D., Adjunct Professor of Diseases of the Eye, Philadelphia Polyclinic. With fifty-six illustrations. The Edwards & Docker Co., Philadelphia. Pp. 99.

There is certainly room for a book of this kind prepared, as the author says, "in the hope that it may prove of assistance to those beginning the study of ophthalmology by enabling them to become acquainted with the technique of the various operative procedures through practice on animals' eyes." Dr. Veasey prefers fresh pig's eyes and no doubt these are the most available and, on the whole, the most satisfactory of all those employed for post mortem operations. On the other hand, a much better idea of the difficulties that the future ophthalmic surgeon will certainly encounter can be obtained by practicing upon the eyes of chloroformed rabbits. Surely a few dozen of these animals can be put to no more useful purpose than teaching the operator how to obtain that delicacy of touch and quickness of muscular preception essential to successful eye surgery. It is quite imperative that the beginner should have some considerable experience with animal eyes,-under conditions that closely approximate those of the human organ with which he is about to deal. In these modern days it is more and more difficult for ophthalmologists to obtain that "bushel of eyes" whose sacrifice was once popularly supposed to be a preliminary proceeding in the education of an "eye-doctor;" while rabbits are a drug in the market. Perhaps, too, if they had begun practicing on living animal eyes some men, now well on to their half "bushel," might have decided that doing iridectomies, removing cataracts and executing similiar manœvres were not their strongest point.

I would suggest that the other method (page 42) for the ripening of immature cataract, attributed to Bettman, be styled the Rinaldi-Bettman operation, as it was first used and described, quite independently of each other, by these opthalmologists, both Americans, although priority must be conceded to the Southerner.

Dr. Veasey's little book ought to have a wide circulation among those who think of practicing ophthalmic surgery and it may well stand as an introduction to that admirable monograph, Czermack's "*Augenärtzliche Operationen*" which, by the way, still awaits a much needed translation into our own language. C. A. W.

Der praktische Arzt als Augenarzt. Kurzes Handbuch für praktische Aerzte und Studierende. von Dr. med. J. Hell, in Ulm.

Verlag von Otto Maier, Ravensburg, 1897.

The General Practitioner as Oculist. A Short Compend for General Practitioners and Students. By Dr. J. Held, of Ulm. Otto Maier, Ravensburg, Germany, 1897. Paper, 16mo., pp. 117.

This small volume, consisting of 117 pages containing about 16,000 words, aims, the author informs us, to supply enough knowledge of the diseases of the eye to serve for the examination of students and the essentials which every general practitioner my be called upon at any time to know and to make use of.

It is a question to what extent brief manuals supply useful additions to the stock of books for students and the general practitioner. Were it certain that they served as agents in teaching the essentials of opthalmology to those who cannot or will not study more complete works and that they did not encourage the neglect of the latter, there would be less opposition to each new arrival of this sort. Avoiding this question altogether, this small volume creates a very favorable impression. Judicious allotment of space, attention to the most important symptoms, and sound advice in regard to treatment prove that the author is familiar with the subject in a practical way. It is not a quiz compend in the ordinary acceptation of this term; it does not strive to give everything in abbreviated form and thus attempt to give a great deal of knowledge forcibly compressed into a form which is very difficult of assimilation. It merely presents those facts which will prove of value to the general practitioner.

It describes fully the methods of applying hot and cold compresses and other therapeutic manipulations about which larger works are frequently silent, but is very brief in the description of those diseases and conditions of the eye which must be referred to the specialist.

The author errs in permitting the student and general practitioner to believe that a working knowledge of the ophthalmoscope is unnecessary and as a result omits all reference to diseases diagnosticated by an examination of the fundus. The paragraphs on trachoma are decidely insufficient considering the frequency with which this disease is treated by the general practitioner. With these exceptions, the author has produced a very readable and useful aid to the student and general practitioner. C. H. M.

Outlines of Ophthalmology.

By Dr. Hosch. *A Text Book for Students.* 504 pages.

(Grundniss der Augenheilkunde. von Dr. Friederich Hosch, Basel, Switzerland. Verlag von Urban ünd Schwarzenberg. Leipsig ünd Wien, 1897.)

If the relative status of the departments of medical science is to be determined by the amount of published matter yearly sent forth by each class of workers, then ophthalmology bids fair to take a high rank.

Our German brethren have been especially prolific the past year; several ophthalmic text books, and monographs galore having come to us from their shores, and now, close upon the heels of the new year comes the above mentioned rather ambitious work. If it is intended for the general medical student, we fear that its comprehensiveness will defeat its own purpose. If it is aimed at the beginner in ophthalmology, it must likewise fail partly of its mission, at least in so far as it neglects to properly represent to him the importance of eye strain as related to the mental and physical development and well being of the rising and of future generations. Strange paradox! that the Germans, who are cursed beyond measure with myopia, should as a professional body, be so blind to ocular prophylaxsis.

The various reflex disturbances and neuroses growing out of ocular defects are not even so much as mentioned. These large truths if they are to bring forth good fruits in due season, must be early implanted in the minds not only of the ophthalmic, but also in the minds of the general medical student. The appreciation of them will serve to clear many an obscure medical problem.

Refraction, in itself an extensive science, occupies but 30 out of a total of 504 pages. In hyperopia the author advises correction of only the manifest error for near work, and orders a still weaker glass for distance! In myopia of low degree, the correction is used only for distance; while in the higher degrees, different corrections are worn for far and near. Nowhere is reference made to the use of a mydriatic in refraction work save in overcoming high grade accommodative spasm.

The slighter functional muscular anomalies evidently occupy but a minor inportance in the author's eyes, as he dismisses the whole subject in three pages! He does not seem to have gotten beyond Von Graefe's investigations.

Like most of its sister volumes, the strength of the book lies in the chapters on diseases of the eye. Here the author is at his best. We believe this part of the volume will give it a permanent lease on life. We wish that the differential diagnosis between conjunctivitis and iritis, and iritis and glaucoma might have been more clearly set forth, as mistakes in this field sometimes involve dire consequences.

A short chapter on the surgery of the eye and its adnexæ closes the book.

Most of the cuts used are familiar, but there are a few new ones that are not without interest. Taken as a whole, the work is a safe guide to those entering upon the study of ophthalmic science, though after finishing the volume, we cannot repress the feeling that "of making many books there is no end, and much study (of most of them) is a weariness of the flesh. REBER.

The Physiology, Morphology and Pathology of the Organs of Special Sensation; Being Vol. IV. of a Treatise on General Pathology and Pathologic Anatomy.

By O. LUBARSCH of Rostock and R. OSTERTAG of Berlin. Verlag von J. Bergmann, Wiesbaden, 1896.

This volume embraces the pathology of the eye, ear and skin. It is to the first division of the book that we will direct our attention. Drs. Axenfeld, Fick, and Uthoff are the contributors. Dr. Fick writes the chapters on Congenital Malformations, Ocular Syphilis, the Eye in Systemic Diseases, the Optic Nerves and Retina, and the Lens. Individually Dr. Axenfeld treats of the pathology of the Sclera, Uvea, and Vitreous, and of Ocular Tumors, also contributing a study of Sympathetic Ophthalmia and of Lymph Circulation in its relation to Glaucoma. In conjunction with Dr. Uthoff he considers fully Ocular Bacteriology and Parasites, and the pathology of the Cornea.

In a work like this, primarily intended for the general physician, we note an unaccountable brevity of the chapters on the Eye in Systemic Diseases, and on Ocular Syphilis (by Fick), which latter is dismissed in four pages. This should not be so. In this day when specialism tends strongly toward extremism no opportunity to cement more closely the general and special worker should be neglected. This was a golden chance to foster the fraternal spirit, although the author of the chapter on the "Eye in General Disease" (Fick), evidently did not account it as such, for he devoted to it but 10 pages, where 50 would be inadequate.

Redundance is so characteristic of the average German style that we are struck with the clear cut manner in which Axenfeld handles the subject of Ocular Tumors. In 70 pages he treats of the various tumors of the eye and its adnexæ on as comprehensive a scale as would ordinarily require 200 to 250 pages. His classification offers nothing new. We miss the suggestion of Panas, namely, "Pseudoplasmes" for those indeterminate new growths that are coming to report with ever increasing frequency. Pseudoplasmes is a very good grouping for those ocular neoplasms as yet unclassed for instance the rhabdomyomata recently reported by Alt.

There is nothing added to the knowledge of sympathetic ophthalmia by Axenfeld's study.

The different chapters are an index of each author's individual experience and investigations together with a judicial consideration of the literature of their subject up to the latter part of 1894.

Collectively they form the most voluminous and authoritative work on ocular pathology that has appeared in recent years.

As a text work they will prove valueless, but as a complete work for reference they will occupy an important place in ophthalmic literature. REBER.

An Autumn Singer.

By GEO. M. GOULD, A. M., M. D. J. B. Lippincott Co., Philadelphia, 1897. pp. 163.

One hardly knows whether it is fit and proper to speak of the dictionaries of Dr. Gould in a special journal like the ANNALS (even if he *is* an ophthalologist), or to mention the fact that he has already published some notable contributions to theological literature. What, then, shall the reviewer say when this versatile writer confronts him with a volume of poems!

Of all the one hundred and forty-one sonnets, songs and verses I like "Day Dreams" (p. 128) best. As a sample of its quality here is the last verse—and there are plenty like it in this pretty little book, with its cover appropriately decorated with autumn leaves:

"All the griefs that will persist,
All the things I might have done,
Stare with large, reproachful eyes,
Mocking wisdom most unwise,
Proffer lips I might have kissed,
Want I have for love unwon,
World I have for world I missed!"

C. A. W.

Eye Operations.

CZERMAK, WILHELM, in Prag *(Augenaertzlichen Operationen)*, Druck und Verlag von Carl Gerold's Sohn. Wien, 1896.

The tenth section (preceding parts reviewed in last number of the ANNALS) includes pages 605-684 of the work and contains 11 original, well made wood cuts. It covers the following subjects: Operations relating to excision, trepanation and ablation of the cornea, corneal cicatrices and keratoplasty. The transplantation operations of v.

Hippel are clearly described as well as the conjunctival flap operation of Durr. Abrasion and scarification of the cornea; the various methods of corneal cauterization, etc., are described. Speaking of galvano-cauterization, the author says: "Cauterization under cocain is entirely painless, the pain without the cocain is minimal. It is done without great re-action, is perfectly harmless and furnishes the strongest form of antisepsis and its limits of action are confined. It is also a stimulant to the regenerative process." The indications are as follows:

1. Large torpid ulcers, or those which proceed despite other treatments.
2. Little deep peripheral ulcers.
3. Infected erosions and wounds.
4. Pannus.
5. The rust marks after removal of particles of iron and recurring erosions.
6. After removal of pterygium.
7. After removal of tumors.
8. Ectasia, staphyloma, keratoconus.
9. Prolapse of iris.
10. Fistula of cornea.

The various operations for tatooing of the cornea and pterygium, removal of tumors and foreign bodies, and corneal suturing are described.

The number closes with the operations on the sclera, sclerotomia, paracentesis, anterior and posterior sclerotomy. H. V. W.

Cure of High Grades of Myopia.

FUKALA, V. (*Heilung Höchstgradiger Kurzsichtigkeit nebst Angabe einer Leichtfasslichen Methode zur Schnellen Berechnung der Axenlänge, optischen Constanten des Auges und Bildgrösse*). Verlag von Franz Deuticke, Leipzig und Wien, 1896.

In this work of 192 pages, illustrated by 28 wood cuts, the author considers the various methods and operations which have been pursued in high grades of short-sightedness and describes the methods of determining the length of the optic axis and the size of the retinal image.

For a couple of decades the idea of removing the lenses in young myopes has been considered, on account of the disadvantages of high grades in business and even in daily life. The correction of cases over—18 or—20. D. by lenses is impracticable in many instances, on account of the smallness of the resultant retinal image, the spheric and prismatic aberration and the intolerance of the patient therefrom.

Since the time of Boerhaven (1668-1738) it has been known that the cause of myopia lies in the lengthening of the eyeball by which the lens is removed farther from the retina and the optic axis consequently increased. Mauthner (1870) showed that the cornea also might acquire a higher curvature. The experiments of later observers to cure high myopia by orthopoedic methods, by such appliances as the "myopodiorthotikon" of Berthold, by convex and concave glasses and tenotomy of the ocular muscles are not to be recommended.

The intra-ocular tension is increased in accommodation and tends to lengthen the eyeball, the circular fibres of the ciliary muscle become atrophic while the radial hypertrophy. After removal of the lens many cases of high myopia require convex glasses. The higher the preceding myopia the weaker the convex glass and if very high, some may require concave glasses even for the near point.

The principal indication for operation is that of Raehlmann. "*It is clear that in very high grades of myopia when the eyes are not helped by glasses and the patient is to a high degree helpless, the operation is the only resort despite its danger and complications.*" Iridectomy and discission is considered the best method and extraction of the clear lens *a la* Valude is not recommended. The clinical worth of removal of the lens in high myopia is placed upon the same plane as iridectomy in glaucoma. The existence of lenticular myopia and the relation of myopia to detachment of the retina is shown. Cases are cited from a number of authorities showing the refraction and results secured by operation. No definite description is given of the methods of operation or treatment. The second part of the book is given up to mathematical estimation of the length of the optic axis and of the size of the visual image, showing the relative difference before and after operation. The explanations are particularly lucid and easily comprehended being much clearer and devoid of abstract mathematical formulae than the works of Donders and Helmhotz. In other respects than those noted the work exhausts our present knowledge of the subject. H. V. W.

Researches Into the Anatomy and Pathology of the Eye.

By E. Treacher Collins, F. R. C. S., Assistant Surgeon to the Royal London Ophthalmic Hospital etc. H. K. Lewis, London, 1896; pp. 140; 10 plates and 26 figures in the text.

This valuable contribution to ocular anatomy and pathology is the result mainly of six years' study of these subjects while the author held the post of Curator of the Museum at the Royal London Ophthalmic Hospital. The whole work is so decidedly interesting that it must be read to be appreciated. Attention is, however, especially directed to page 12, where the author gives a very ingenious explanation of the manner in which cells grow over the posterior capsule of a cataractous lens. As is well known the crystalline, in its normal condition, has no epithelial covering on its posterior aspect. Collins believes that it is the rather constant tension exerted upon them by the ever-growing organ that converts cells into lens fibres. In lenses which undergo senile changes this tension is lessened. through shrinkage of the whole mass, so that instead of being elongated into and so forming part of the lenticular structure they overrun the posterior capsule and line it.

Equally interesting is the pathological anatomy of ciliary cysts (p. 67), adenoma and carcinoma of the ciliary body (pp. 68-71), cases of glaucoma in which it is difficult to explain the increased tension (Chap. V), rupture of the suspensory ligament (p. 125) and concussion cataract (p. 127).

The author gives an opinion and some advice, the value of which may well be questioned. "I should like to urge," says he, on page 120, " the necessity of performing an iridectomy early in cases of chronic glaucoma. I think in some cases, even, it would be well to perform what might be termed a preventive iridectomy for this disease: that is, to perform an iridectomy when only the subjective symptoms are present and when no deterioration of vision has occurred. The risks of an iridectomy in such an eye are very small—they can hardly be considered greater than the risks of a preliminary iridectomy for the extraction of cataract. The chances of success, in preventing or relieving increased tension, of an iridectomy performed before adhesion of its root to the cornea has occurred are infinitely greater than after such adhesion is established." Considering the great, indeed almost insuperable, difficulties that lie in the way of an early diagnosis of chronic glaucoma and the ill-defined boundary that separates many of these, symptomatically, from other diseases of the ocular structures this seems rather dangerous doctrine to preach. Probably, however, Mr. Collins has in his mind's eye a more clearly defined idea of the disease than have some ophthalmologists who confidently establish an early diagnosis of glaucoma, "when only subjective symptoms are present."

The reviewer wishes he had had access to the chapter (p. 128) on "blood-staining of the cornea," before contributing an article to the July Annals on "Pigmentation of the Cornea." The matter is discussed in the small volume under review in a very effective manner and in the light of seven cases examined microscopically. Altogether, Mr. Collins' work is among the few original contributions to ophthalmology that have appeared during the past year. C. A. W.

Anomalies of Refraction and of the Muscles of the Eyes.

By Flavel B. Tiffany, M. D., Professor of Ophthalmology and Otology, of the University Medical College of Kansas City, Mo. Illustrated; cloth; 307 pages. Hudson-Kimberly Pub. Co., Kansas City, Mo., 1894.

This little book furnishes, in a clear and practical manner, a great deal of information that will be useful to those beginning the study of ophthalmology. The student will be able to read, with some understanding, all that is required of him in working out errors of refraction without wading through a number of pages of theory—difficult for him to understand at first without its practical application. The chapters on "Heterophoria" and "Strabismus," give a clear insight into a subject that is always more or less confusing at first. The book is well illustrated and printed on good paper in large type.

WOODRUFF.

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CLINICAL HISTORY OF AN OPERATION FOR CICATRICIAL ECTROPIUM WITH ADVANCEMENT OF THE LEVATOR PALPEBRÆ.[1]

BY CHARLES A. OLIVER, A. M., M. D.,

ONE OF THE ATTENDING SURGEONS TO THE WILLS' EYE HOSPITAL; ONE OF THE OPHTHALMIC SURGEONS TO THE PHILADELPHIA HOSPITALS, ETC.

On the 23d of October, 1896, Dr. Charles J. McFadden, of Pittston, in this State, brought an eight year old boy to me at my clinic at Wills' Eye Hospital, with the history of having had the left upper eyelid hooked and torn by a cow's horn four weeks previously. The lacerated tissues were united and stitched into position as well as possible under the circumstances, by Dr. Lewis H. Taylor, of Wilkes-Barre.

When first seen there were two irregular curvilinear cicatrices extending from a broad break in the inner extremity of the ciliary margin up and out to the middle of the lid, from which a long curved superficial skin scar, almost reaching the outer border of the lid, extended.

The outer two-thirds of the lid were completely everted with an almost absolute hernia of the thickened cul de sac. The tarsus itself was so split and cicatrized, and the skin tissues were so firmly bound together along the superficial cicatrices, that it was impossible to either bring the lid into proper position or to lift it from the ciliary border of the underlying lower lid. Just above the cicatrices a long strip of loose tissue seemed to be devoided of the support of any underlying tarsus.

The eyeball was intact and the lower lid was uninjured.

Two days later, whilst the patient was under the anesthetic influence of ether I exercised as much as possible of the hypertrophic conjunctival tissue, leaving a horizontal lozenge-shaped area, the edges of which were united by a series of fine interrupted sutures. The superficial and deep cicatrices were carefully recut and trimmed to a sufficient distance to allow the lid to be inverted into its proper position, and a number of interrupted sutures were so placed as to practically mat the skin, muscle, tarsus and conjunctiva into their normal relations.

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[1] Read before the January, 1897, meeting of the Section on Ophthalmology of the College of Physicians of Philadelphia.

The field of the operation was dressed by an ordinary occlusive antiseptic bandage. There was but little reaction, which was kept in abeyance by the judicious use of ice compresses and thorough cleanliness.

Although the lid seemed in good position, yet on the 4th of November, by reason of the appearance of a large wedge shaped piece of hypertrophied conjunctiva into the palpebral fissure just above the position of the upper canaciculus, the entire area between the two original cicatrices with the bulging hypertrophied conjunctiva that extended through the lid, was excised. The edges were neatly freshened and brought together, leaving a lid, which, with the exception of the marked drooping, looked exactly like its fellow. The wound was dressed in a similiar manner as was done at the first operation.

After healing had established itself in several days' time, it was determined to endeavor to find the levator palpebræ and, if possible, to attach it to the remaining rim of tarsus a couple of millimeters above the ciliary border.

On November 27, with the kind assistance of Drs. George C. Harlan and William F. Norris, a long curvilinear incision parallel with the ciliary border about half way up the lid was made through the skin and underlying tissues down to the orbicularis muscle. The fibres of the muscle were carefully teased apart, and, after much free dissection up and in under the orbital margin, the fan-shaped sheath of the levator was found and secured by two sutures and held by an assistant while the muscle was dissected loose from a mass of false cicatricial tissue.

After the levator had been freed, and could be easily pulled down, its free extremity was trimmed and attached to the upper edge of the central position of the remaining tarsus by carrying the threads through the tarsus and making two deep sutures, thus allowing by resection and advancement, the muscles to act upon the lower and fixed part of the upper lid. This being done, the orbicularis fibres were smoothed into position, the gaping wound was thoroughly flushed with warm sterile water, and its edges brought together by several fine superficially placed sutures.

A few days later the stitches were removed, it being necessary to etherize the patient in order to remove the deep ones without injury to the field of operation.

In three weeks' time the patient was discharged from the hospital with a lid which, in appearance, could not be differentiated from its fellow, and which enjoyed as free movement.

REMARKS:—The case is interesting not only from the peculiarity and comparative rarity of the character of the accident, but is instructive in showing the various steps of operative procedure pursued to overcome a deformity that would have been both permanent, and probably, sooner or later, detrimental to the functional activity and power of the eye itself.

The almost complete eversion of the upper lid, the dense and irregular cicatrices binding the skin-surface of the lid together, and the almost entire loss of the tarsus, were complications that at first sight might appear insurmountable.

The drooping and immobility of the repaired lid from having lost its attachment to its levator muscle offered, as it did more than a quarter century ago to Dr. John Green of St. Louis, in an almost identical case, an opportunity of making useful a perfectly healthy misplaced muscle in performing its proper functions.

For these reasons, and to stimulate other surgeons when confronted with the same character of disturbance to pursue similiar or better and improved methods, have been the reasons that I have thought well to make a brief résumé of the case.

UNUSUAL TORTUOSITY OF THE RETINAL ARTERIES.

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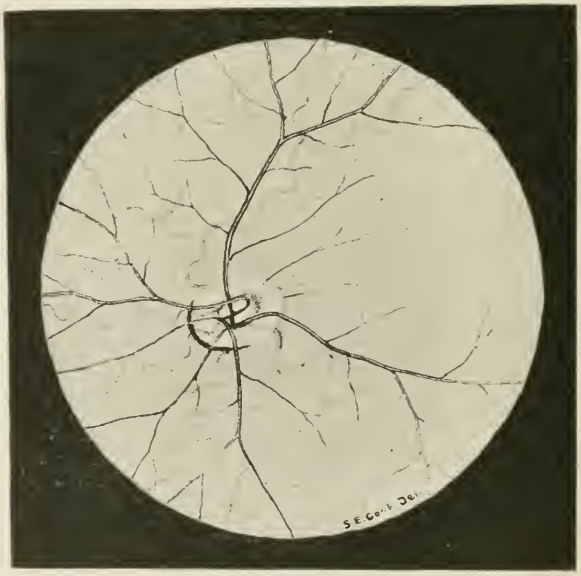
Illustrated.

The accompanying plate is an ophthalmoscopic representation of the fundus of the right eye of a young lady of twenty-six. It is a remarkable instance of tortuosity of the arteries of the retina, indeed, so marked, that, by some, it might not be considered as coming strictly within physiological limits.[1] It is a congenital anomaly, however. The patient, a perfectly healthy subject, without cardiac



Unusual Tortuosity of the Retinal Arteries of congenital origin. Astigmatism of 4 diopters. Right Eye. Inverted image.

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[1] An excellent drawing of physiological tortuosity of both arteries and veins appears in Frost's *Fundus Oculi.* The condition is practically confined to hypermetropic eyes, and Mr. Frost suggests that retarded development may be the causative factor. The folded condition of the retina, which exists in early fœtal life, has never entirely disappeared.

or renal disease, has 4'D. of mixed astigmatism, with axis oblique, and marked physiological cupping of the disc, as shown in the figure. Corrected vision in this eye = $\frac{5}{10}$. The left eye shows almost exactly the same condition, and after correction of a like amount of astigmatism, vision also = $\frac{5}{10}$. The arteries are, without exception, exceedingly tortuous, in the same plane as the inner layers of the retina, and this tortuosity extends apparently even to their finest ramifications. The veins do not take part in this peculiarity, indeed, they are even straighter than usual. The relative diameter of the two sets of vessels is not altered, nor is any other pecularity manifest. H. T.

A remarkable and significant circumstance is the existence of a similar condition of the retinal arteries in a younger sister of the patient, whom the writer has since had occasion to examine. In the latter case the anomaly also occurs in both eyes, but, after the correction of a moderate degree of hypermetropia, vision is normal for each eye.

In the normal retina, as viewed by the ophthalmoscope, there is rarely any great degree of crookedness in either set of vessels. If there is any departure from this rule, it is almost invariably the veins which are the more tortuous. Indeed, it is the rule for the veins to show a very moderate degree of tortuosity, while the arteries usually run very direct.

The barrenness of the literature on this subject is remarkable, and about all the writer has been able to glean is comprised in a few lines of the first volume of Loring's classical work. He mentions the fact that the arteries may approach the veins in size, and, indeed, may be more tortuous than the veins. Cases of great tortuosity, of both sets of vessels, have been reported by Nettleship and Benson.

The border line, between the physiological and the morbid, is often so vague and indistinct that even the adept may have difficulty in locating it. A proper appreciation of all the various conditions, appearances and phenomena, which may occur entirely within physiological limits, is a *sine qua non* to a thorough understanding of what is morbid. In no branch of our science is this more indispensible than in ophthalmoscopy. A few points carefully noted will enable us nearly always to decide the question promptly. In the present instance, the occurrence of the tortuosity in both eyes, and to a similiar degree in each organ; the confinement of the deviation to the lateral plane; the absence of present or past signs of any inflammatory disturbances; and the existence of the anomaly in two—and perhaps more—members of the same family, clearly excludes anything of a pathological nature.

PRELIMINARY IRIDECTOMY IN THE EXTRACTION OF SENILE CATARACT.

By W. Franklin Coleman, M. D., M. R. C. S., Eng.
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At my clinics I am in the habit of urging surgeons to perform a preliminary iridectomy in the extraction of senile cataract. This advise is based upon the conviction gained from literature, personal experience and interviews, that this particular procedure would afford them the largest percentage of success. This reduction of failures to the least number is a much more desirable goal than the securing of the greatest average vision. For myself, the operation which would most probably succeed, for example, in giving $\frac{1}{4}$ average vision in 95 per cent. and a loss in 5 per cent., should be preferred to one which affords $\frac{1}{2}$ average vision in 94 per cent. and a loss in 6 per cent.

So long as operators continue to perform the simple extraction upon selected eyes, and the combined or preliminary iridectomy in the complicated cases, it will be impossible to determine from their reports which operation results in the best average vision and the fewest failures. Perhaps, at present, an estimate may best be formed by noting the advantages and disadvantages urged in favor of and against particular operations. My contention is that the combined extraction is easier and safer for most operators than the so-called simple, and that a preliminary iridectomy unites all the benefits and avoids all the dangers of the simple and combined operations. I am indebted to Landolt for many opinions, collaborated from a large number of colleagues in all countries, of every age. His paper "Cataract Operations in Our Time" (*Oph. Rev.*, Oct. and Nov., '92) is the most comprehensive one known to me. He writes: "The majority favor iridectomy, which they perform in the majority of their cataract operations," and "I do not expect to meet much contradiction when I declare that the extraction of cataract is never easier, simpler, nor more durable than when performed on an eye in which the iridectomy has been previously made."

L. Bergeson reports (These Annals, Oct., '96) that Landolt, in a great many cases, performs a preliminary iridectomy, believing that, in the majority of instances, it insures a better result.

In 1858, Critchett and Wells remarked to me that if their patients would submit to two operations they would always prefer a preparatory iridectomy.

Bowman thus expressed his faith in it: "If my soul's salvation depended upon the success of a cataract extraction, I would perform a preliminary iridectomy."

Not a few authors and some of my colleagues, when interviewed, favor the operation upon an eye when its fellow has been lost, still they do not generally practice this preliminary iridectomy. Further comment is unnecessary.

Walton, in 1860, and Mooren, in 1862, proposed the general adoption of a preliminary iridectomy in the extraction of cataract.

Steffen has operated by this method since 1888, Rosebrugh of Toronto since 1885, and the number who use it is, as Landolt says, much larger than we suppose.

Brockman (*Oph. Rev.*, Aug. '84), advocates the preliminary iridectomy in general debility or in the timid. As it inflicts, at one time, a less severe injury to the eye, and affords, thereby, a better chance of recovery, yet he practices the simple operation.

Prof. Dor declares that if he had to undergo a cataract extraction he would have a preliminary iridectomy.

The Combined Operation.—A director of one of the largest hospitals in the world writes, that, at the hospital, he operates without an iridectomy, but in private practice, with one (Landolt).

Many, among whom are Bobone, Foucher, Grut, Hansen and Osi, have resumed iridectomy after experimenting with the simple operation (L.).

Pagenstecher's advice to young opthalmologists is: "You should always make an iridectomy in the extraction of cataract. It is easiest to perform, and affords the best chance of restoring vision."

Daviel, the first to extract cataract, performed in 1745 the simple operation, and later introduced the iridectomy, thus spoiling, for all time, the fitness of the word "new" as now applied to the former procedure.

Charles Bell Taylor states (*Annales d'oculistique*, Feb., '95): "The modified Graefe is to-day the favorite operation with the majority. It increases the chances of future vision."—This, while he practices the simple operation!

Simple Extraction.—Roosa states (1889): "It is the operation most frequently performed in New York."

Graefe writes in the *Archives of Ophthalmology*, July, 1892: "It has obtained less of a foothold in Germany than in England, France or America."

Knapp reasserts in the *Archives of Ophthalmology*, April and July, 1890: "Simple extraction is not only the best but also the safest method of removing cataract."

It will not be denied that this is true, for the operator who has been so fortunate as to secure a third series of 100 simple extractions, and has succeeded in reducing the intercurrent iridectomies from 17 in the first 100 to 7 in the third, and the prolapses of the iris from 12 in the first to 8 in the third series. Schweigger, Panas, Gayet, de Wecker, Galezowski, Snellen, Teale and Knapp are among those who porform the simple extraction.

The advocates of the simple operation claim:

1. "If successful, it preserves a central, circular, moveable pupil."

I reply to this: Since, in most persons, the upper lid reaches nearly to the upper border of the normal pupil, a superior colobomo is scarcely, if at all, noticeable.

2. "Acuteness of vision is greater."

This is an open question. Gayet, in 195 operations with iridectomy and in 195 operations without, got an average vision in each class of $\frac{1}{8}$.

Fuchs, Graefe, Haas, von Hippel, Samelsohn, Schiess, Swanzy, Manz and Landolt found no difference in the two classes.

Noyes writes: "The summary of results may be fairly taken from Schweigger's statistics:

"371 with iridectomy: Success in 75.1 per cent; secondary cataract, 19.2 per cent; loss, 5.7 per cent.

"450 without iridectomy: Success in 76.5 per cent; secondary cataract, 19.1 per cent; loss, 4.4 per cent."

We are not informed whether this apparently slightly more favorable result of the latter series was due to the judicous selection of cases.

Marshall, the curator of the Royal London Ophthalmic Hospital, has furnished us with one of the most valuable reports of the result of cataract extraction, because it represents the different operations performed on a large number by the various members of the staff.

From 1880 to 1893:

$V=\frac{6}{6}$ to $\frac{6}{18}$ in the combined operations, 76.28 per cent.;
" " in the simple " 78.38 per cent.;
" " preliminary iridectomy, - 73.70 per cent.

$V=\frac{6}{24}$ to $\frac{6}{60}$ = about equal in each class.

$V=\frac{5}{60}$ to counting fingers: Simple operation, 2.47 per cent.; combined, 5.2 per cent.; preliminary iridectomy, 6.69 per cent.

V=hand-movement and less: Simple, 5.52 per cent.; combined, 4.95 per cent.; preliminary, 5.99 per cent.

$V=\frac{6}{60}$ at least, *i. e.*, successful cases: Simple, 91.97 per cent.; combined, 89.81 per cent.; preliminary, 87.29 per cent. Marshall remarks: "This, I take it, is distinctly in favor of operations with iridectomy. These figures go to prove the frequent observations, that cases of extraction without iridectomy, when they do well, give the best results; but, should any complication occur, they do much worse than when iridectomy has been done."

3. "Eccentric vision and orientation are better."

Increase of pupillary field does not hinder a person in getting about. Perhaps the opposite would be the case (Berlin).

4. "The capsule is less likely to be incarcerated in the wound."

5. "It is a shorter operation by the absence of an iridectomy."

We may remark, the eye which presents a preliminary coloboma affords the same advantage.

6. "There is no hemorrhage."

The last proviso also applies to this statement.

7. "A sort of accommodation exists with a round pupil (Bell Taylor)."

There is no accommodation possible in aphakia (Donders and Helmholtz).

8. "More distinct retinal images in proportion as the pupil is smaller."

Not the pupil, but the opening in the capsule, is the visual aperture (Landolt).

9. "There is less dazzling."

This comparison could only apply generally to the lower coloboma. In 1876 Galezowski was operating by the lower iridectomy, and we did not hear any complaint of dazzling from his patients, much less from my own at any time, with an upper coloboma.

10. "Absence of a wound of the iris; hence there is less trauma from which to recover."

In preliminary iridectomy the iridic wound has recovered at the time of the extraction.

In the simple operation the iris, if rigid, is not free from the bruising due to the forcible delivery of the lens.

11. "An intact iris is said to retain vitreous."

Bull, in 100 cases of simple extraction, had escape of vitreous in 13. Marshall states the loss of vitreous in the simple operation to be 2.99 per cent.; in the combined operation, 3.75 per cent.; in the preliminary iridectomy, 10.81 per cent. He attributes the 10.81 per cent. to the unsoundness of the eyes.

The increased pressure required to deliver the lens in the simple operation and the large incision tend to produce prolapse of the vitreous.

12. "The intact iris prevents infection of the interior of the eye."

Recently, the absence of infection after all methods of extraction is probably most indebted to asepsis. Marshall gives suppuration after extraction by preliminary iridectomy 1.58 per cent.; after the combined operation, 1.72 per cent., and after the simple operation, 1.78 per cent.

Disadvantages of the Simple Operation.—These are admitted by such advocates of the simple operation as Bull, Noyes, Knapp, etc.:

1. The technique of the operation is decidedly more difficult.

2. The corneal incision must be larger, as the presence of the iris acts as an obstacle to the passage of the lens.

3. The necessity of a rapid section to avoid the wounding of the iris renders it difficult to make the height of the flap an even curve.

4. Sufficient capsulotomy is not so easy.

5. More difficult to remove the lens.

6. Posterior synechia more frequent. "In 60 per cent. of the cases" (Bull).

7. The operation is not applicable to all cases.

8. Disposes to chronic irido-choroiditis (Eperon).

9. One-half the chance of a clear pupil that there is with a coloboma (Hansen Grut).

10. Secondary operation more frequent. Knapp performs this, as a rule, to improve vision, and thinks, with Bull, that it is without danger.

I share, with others, the dread of operating upon a tough secondary membrane.

Trousseau had 2 per cent. of iritis in cataract extraction, and no case of suppuration in 300 extractions, while he had 12 per cent. of iritis and 6.25 per cent. of suppuration after discission. "Discission is demanded in $\frac{2}{3}$ of simple extractions (Bull).

11. Requires a tranquility of which many patients are incapable (Manolesen).

The conduct of the patient is beyond control.

12. Increased astigmatism (Noyes).

13. Last and greatest—prolapse and incarceration of the iris.

Prolapse of the iris may occur in any eye after a faultless operation, under the most careful after-treatment (Knapp). In 106 selected cases of simple extraction, Little had 19 per cent. of prolapse of iris. In 322 cases with iridectomy, one case of prolapse. Swanzy had one prolapse in 200 combined operations. In 451 simple operations Schweigger had 8 per cent. of prolapse. In his last 200 simple extractions Galzowski had only one prolapse. C. S. Bull claims he rarely has hernia after extraction. Swanzy had only 1 per cent of prolapse in 200 combined operations.

In 1169 simple operations, Brockman (Madras), had 11.79 per cent. of prolapse of iris, and yet he remarks, "with due precaution there is not much likelihood of a prolapse."

Prolapse of the iris occurs from two to three days to one week after extraction (Hansen Grut).

Schweigger, in 451 cases of simple operation, had 7.9 per cent of prolapse of iris. Prolapss of iris after extraction and iridectomy, 0.87 per cent; without iridectomy, 13.86 per cent. (Marshall).

The condition of the eye when a prolapse has occurred: (1) No healing can take place. (2) The road is open to the interior of the globe for septic organisms. (3) The prolapsed portion becomes gangrenous or covered with plastic exudation. (4) An iridectomy must be done under the most favorable conditions. (5) After excision of the iris it often remains entangled in the wound. (6) The eye is liable, in consequence, to iritis, sympathetic ophthalmia, or cystoid cicatrix.

Seconday glaucoma is more frequent in the simple operation. According to Marshall's figures, it occurred in the combined operation in 0.42 per cent., with a preliminary iridectomy in 0.71 per cent., and in the simple operation, 1.17 per cent.

Charles Bell Taylor holds the unique opinion (*Lancet*, Jan. 18th, '96), that the great majority of the subjects of prolapse are no worse off than if iridectomy had been done in the first instance.

Cases in which prolapse of the iris occurred after extraction, and their results:

With iridectomy, when $V=\frac{6}{6}$ to $\frac{6}{60}$: 83.32 per cent.; without iridectomy, 83.78 per cent. With iridectomy, when $V=\frac{5}{60}$ to 0: 16.60 per cent.; without iridectomy, 8.11 per cent. With iridectomy, dnucleation, 0.; without iridectomy, 8.10 per cent. (Marshall).

Advantages of the combined operation in extraction of cataract.—These are for the most part implied in the list of the disadvantages of the simple operation:

1. Iridectomy counteracts a secondary iritis (Schmidt-Rimpler). It may prevent complications which would lead to inflammation (Schweigger).

2. It does not require so large or rapid a corneal incision.

3. A complete capsulotomy is more readily made.

4. The delivery of the lens is more easy and the "toilette" more perfect.

5. Fewer secondary cataracts follow, and, therefore, fewer secondary operations are necessary.

In 130 extractions, with iridectomy, Kiew performed only 4 discissions; 7.7 per cent. discissions in extraction with iridectomy; 14.2 per cent. discissions in simple operation (Schoeler's Clinic, Berlin).

6. Prolapse of the iris is rare—only one prolapse in 500 consecutive operations by Tacke.

7. The operation is adapted to complicated cases.

Haskett Derby performed 100 modified Graefe extractions without anæsthesia, with only a single failure (*T. Am. Oph. Soc.*, 1881).

Disadvantages of the combined operation.—These are largely suggested in the advantages of the simple operation:

1. It prolongs the operation.
2. It is more painful.
3. It is sometimes complicated by hemorrhage. In 221 extractions, with iridectomy, by Strawbridge, there was

profuse hemorrhage into the chambers in seven cases, and in three of these the operation had to be postponed.

4. Impaction of capsule in wound more frequent. A horizontal cystotomy or the removal of a large piece of anterior capsule is recommended as a means of lessening this tendency.

Advantages of preliminary iridectomy.—There is a reasonable excuse for the consideration of an operation which not a few regard as the safest for the extraction of cataract, but about which some authors (Mittendorf, Noyes, Mayer, de Schweinitz, Schweigger, Fuchs and Fick) are silent.

1. The maturing of an unripe cataract is frequently hastened (Snellen, Becker, Foerster, Steffen). I have frequently noticed complete opacification of the lens in two to four weeks after the iridectomy in patients who could count fingers at three to six feet at the time of the operation.

2. The diagnosis of the character, extent and size of the cataract are facilitated.

3. The amount of self-control possessed by the patient and his probability of recovery from an operation are indicated. Recently, a patient was so uncontrolable during the iridectomy that chloroform was administered for the extraction, which was smooth and successful.

4. During the extraction, there is no hemorrhage from the iris.

5. The iris is not wounded by falling over the knife.

6. There is an unobstructed doorway opened for the cystotomy and expulsion of the lens and cortex.

7. The iris wound has healed, leaving only the corneal incision to unite.

8. There is no pressure trauma of the iris, as in the simple operation.

9. The operation is shorter and less painful than the combined method.

10. It lessens the danger of iritis, and allows the cataract to be removed befere it is quite mature (Juler).

11. It is the operation best suited to complicated cataracts and not unsuited to any. A. v. Graefe performed this operation in unfavorable cases, or, when a former operation had terminated in suppuration. Steffen, in 530 extractions, has had much fewer cases of infection in his operations with preliminary iridectomy than in the combined

operation. Strawbridge reports (*Trans. Am. Oph. Soc.*, 1886) 251 cataract extractions in which preliminary iridectomy was performed in 51 cases, and the combined operation in the remainder. I find, by carefully analyzing these cases, that 16 per cent. in which preliminary iridectomy was performed, were sufficiently complicated to affect the resultant vision and success of the operation, while only 4.9 per cent. of the cases of combined operation were thus complicated.

Notwithstanding these cases of preliminary iridectomy are so heavily handicapped, they finish 50 per cent. ahead in average vision, and only 2.12 per cent. behind in successes. The average vision is $\frac{3}{10}$ in the extractions with preliminary iridectomy, and $\frac{2}{10}$ in the combined operations. The total loss in the former being 9.43 per cent., and in the latter 7.30 per cent.

12. Preliminary iridectomy exposes the eye least to a secondary operation (Pfleüger).

A secondary operation is more dangerous than a preliminary iridectomy (Landolt).

I make an iridectomy two to three weeks prior to an extraction. In case of urgency there need only be an interval of a few days between the iridectomy and extraction. "I never resort to any other method" (Wolfe). Brockman (Madras,) performed extraction seven days after the preliminary iridectomy in 33 cases.

Disadvantages of a preliminary iridectomy.—1. The inconvenience of two operations. Apart from the inconvenience to the patient of two operations, and of the double confinement to bed, preliminary iridectomy can be recommended if we wish to act with the greatest certainty (Schmidt-Rempler). As to confinement to bed after an iridectomy, it does not seem to me in the least necessary; in fact, it may be safely done as an office operation.

2. The lengthening of the confinement of the patient. While the patient may be discharged in two weeks after the combined operation, a week after the preliminary iridectomy he may be allowed to return home if convenient, or wait another week for the extraction.

3. The question of two risks in two operations. In a conversation Dr. Knapp raised this objection to preliminary iridectomy: While every operation involves a risk, it seems to me that the chance of recovery is increased by dividing the trauma between two operations, that the eye

would recover more certainly from a small corneal wound and an iridectomy, and subsequently, when perfectly quiet, from a large corneal wound, than from a large corneal wound and iridectomy inflicted simultaneously.

With opinion and facts so much in favor of preliminary iridectomy, we can account for the scanty trial of the method only on the ground of the demand of patients to be returned to their homes by lightning express. I do not deny the brilliant success of cataract extractions by the various methods at the hands of those who have very large opportunity. Still there must be, inherent in the operation, a safest and best way, which should be adopted by the majority of operators, and especially by young ophthalmologists, for whom I have mainly ventured to consider the subject of preliminary iridectomy.

A CASE OF METASTATIC CHOROIDITIS FOLLOWING PUERPERAL SEPTICAEMIA.

By J. Herbert Claiborne, M. D.

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Mrs. F., aged 27, primipara, had a normal labor. Three days after labor, fever arose, continued, and was lowered by antipyretics, It returned as soon as the latter were discontinued. The diagnosis of septic infection through the genital tract was made. Two weeks after the commencement of the fever she suddenly noticed that she could not see with the right eye. At the same time, the eye became much swollen. On the following day I saw her, having been called in consultation by Dr. Robert Campbell, who had treated her since her confinement.

Status oculi dextri—Lids swollen, bulba conjunctiva chemosed, so that folds of the conjunctiva projeeted between the lids. There was then a sanious secretion. The eyeball was very prominent, the cornea clear, the aqueous clear. The pupil was moderately dilated and fixed. On the anterior capsule of the lens there was a dense mass or aggregation of white dots, which were distinctly dry, giving in every respect the appearance of an ancient or congenital opacification of the anterior capsule. Tension was normal. No reflex from the fundus could be got. V. = No perception of light by ordinary means. When the rays of a candle wer focused upon the pupil a faint light was perceived.

Status oculi sinistri.—No swelling of lids or conjunctiva, nor protrusion of eyeball. The eye appeared normal to superficial examination. The pupil reacted to light, and fingers were counted at fifteen feet. Minute examinution with bi-focal illumination discovered a few dry spots on the capsule of the lens, similar to those seen in the right eye. The fundus reflex by candle light was so slight that no picture could be seen.

The diagnosis was reserved, and atropine was ordered, together with ice-cloths for the right eye. The following day the pupils were fairly well dilated. The fundus was not visible in the right eye, but a reflex from the vitreous humor, yellow as gold and cloudy, was seen. The lens was partly opaque, and the exudate on the anterior capsule still appeared as on the preceding day. Chemosis and exophthalmos less. In the left eye the fundus was barely visible, the vitreous humor was hazy, and the opacities in the lens were few, apparently on the anterior capsule, and dry in appearance. The fingers could still be counted at ten to fifteen feet, but there was now slight exophthalmos, some chemosis and swelling of the lid.

Metastatic choroiditis was diagnosed, and an unfavorable prognosis, both for sight and life, was given. I was dismissed from the case, but was called again in consultation ten days afterward. The chemosis was almost gone in both eyes. The exophthalmos was less, but the vision was absolutely extinguished in each eye.

In the right eye the pupil was still dilated, as if by atropine; there was a yellow mass in the pupil, and to some extent on the iris, as if the lens were infiltrated with pus. The aqueous humor and cornea were cloudy, Tension about normal.

In the left eye the cornea and lens were more cloudy than in the right, and the iris was scarcely visible by oblique illumination. The patient was sinking, and the fever continued, but, curiously enough, there was no headache nor delirium, her mental powers being peculiarly clear, I retired once more from the case.

The patient was seen again in about a week or ten days. V.=0 in either eye. There was a small rupture in the conjunctiva of the left eye, between the inferior and external rectus, out of which dribbled a muco-purulent discharge. There were abscesses in the arms and legs, along the muscles, but not in the joints. These were opened, and much pus evacuated. The corneæ and irides were clear, the pupils dilated and fixed, but a yellowish reflex was distinctly seen in each vitreous humor. The lenses were nearly clear. The patient seemed to be recovering, and was much more cheerful. The fever was kept well in hand with antipyretics. In a week, I was informed by the family physician that the patient was dead.

In the *American Journal of Obstetrics* for May, 1894, and in the *Medical News* of April 27, 1895, Dr. Casey A. Wood reported a case of metastatic choroiditis occurring in a woman who had had four pregnancies. Her recovery after each pregnancy was good. In the first pregnancy the child was born dead. In the second the child lived, but was unhealthy. The third resulted in miscarriage. The fourth child was born dead at the seventh month. After this pregnancy metastatic choroiditis appeared. The patient was attacked three days before the birth by pain in the eyes, after which the classical picture developed. The lids became enormously swollen, the eyeballs protruded, the corneæ were eaten away, and from the apertures pus oozed. There were no evidences of pyogenic foci in any other portion of the body. Both eyes, of course, were lost, but the patient recovered, and still lives.

The literature of metastatic choroiditis following septicæmia is far from large, but there can be no doubt that this disease occurred quite frequently in the days before aseptic midwifery. The text-books and systems on the science and art of obstetrics are singularly reticent on this subject. Garrigues makes reference to it, but states erroneously that the disease commences in the conjunctiva, and that pus later forms between the choroid and the retina. Playfair also devotes but little space to its discussion.

In the monograph entitled *Uterus und Auge*, Salo Cohn says that metastatic choroiditis, or, as he describes it, puerperal panophthalmitis, is the most dreadful and severe disease of the eye that can afflict the puerperal woman, both for eyesight and for life. Salo Cohn also says that cases of this affection were observed as early as 1774, by Tennon, in the Hotel Dieu at Paris.

Virchow was the first to point out the embolic character of this affection, but finds it difficult to say whether the retinal or choroidal vessels first receive the pus.

Kipp of New Jersey, in the *American Journal of the Medical Sciences*, 1884, reports a case of unilateral puerperal metastatic choroiditis in which the patient recovered, but the eye was lost.

Hirschberg has had a phenomenal experience in observing this disease, and has recorded nine cases, all of which were bilateral, and in all of which both eyes and life were lost. Wood's case is one of the few in which both eyes were affected and recovery took place.

Hirschberg's description of this disease is so nearly classical that it is entitled to transcription, He says: "The eye affection usually sets in between two and three weeks after confinement. There is a sudden loss of vision, cloudiness of the vitreous humor and of the eye-ground. After one or two days there is intense inflammation of the uveal tract. Exudation shows itself in the area of the pupil, pus is seen in the anterior chamber, and conjunctival œdema and pericorneal injection follow the blindness or set in with it. Protrusion of the eyeball, with restriction of its movements, is next in order. Then cloudiness of the cornea, and rupture of it or the sclera, are followed by atrophy of the entire eyeball, unless death soon relieves the patient.''

It will be observed, by referring to my case, that the symptoms set in two weeks after the fever, and that the patient suddenly noticed that blindness in the right eye was present. It will also be observed that I referred to exudate upon the anterior capsule of the lens. This exudate did not correspond to the exudate as described by Hirschberg and others. In my case it was distinctly dry in character, so much so, indeed, that it gave me the impression of being an old opacification of the anterior capsule of the lens. This occurred in both eyes. My case differed from others in this respect, also, that the cornea was not ruptured at any time, and that in the right eye there was no rupture of either cornea or sclera, but in the left eye there was, apparently, a rupture of the sclera downward and outward between the external and inferior recti muscles. At least, there was a rupture of the conjunctiva, and sanguinous pus flowed through the aperture. Unfortunately, I did not have an opportunity to see this patient just before her death, and the surgeon who called me in consultation was also dismissed from the case some time before her death, so that he could not give me any information as to the condition of the eyeball at that time. I saw the case, however, sufficiently long to observe that the symptoms of inflammation had distinctly disappeared, so that the cornea and iris were both clear. The lenses were also clear, and only a distinctly yellowish reflex could be seen in the vitreous humor.

My case was likewise characterized by the development of abscesses along the long bones of the forearm, the leg and the thigh, *i. e.*, abscesses in the cellular tissue. There were no pyæmic foci in any of the joints. The patient did not complain of the heart, and I was not able to detect any symptoms of endocarditis. During the whole course of her illnsss, as long as I had her under observation, she was practically without pain in her eyes or head, and she did not suffer from delirium. In fact, she was singularly clear-headed.

Symptoms of metastatic choroiditis that follow upon puerperal septicæmia are in no wise different from those that follow septicæmia from surgical infection. The clinical histories are the same. At one time it was supposed that the general infection of the system by pyæmic foci in puerperal septicæmia was occasioned through the endometrium, but this, however, seems to have been laid aside and, although it is certainly possible that infection may take place through the endometrium, it is more probable that general infection occurs through wounds or rents in the genital tract. This, indeed, would reduce puerperal septicæmia to surgical infection. At one time it was held that puerperal septicæmia was a disease of itself, such as typhoid fever, or some other distinct individuality, but we now recognize it to be nothing more than surgical infection.

Hosch found organisms in the vitreous humor that closely resembled leptothrix.

Heiberg discovered micrococci in the lymph channels of the cornea.

Leber found in the case of Wagenman septic foci in the cardiac valves, in the muscular tissue of the heart, and in the kidneys. The microscope showed streptococci in the retinal vessels and diapedesis of those into the retina and vitreous humor, likewise masses of them in the iris, choroid, ciliary body, conjunctiva, muscles, and orbital tissues. In the left internal carotid artery, a thrombus of white corpuscles and fibrin was found. No microbes, however, were found in this. The streptococcus seems without much doubt to be the source of infection.

There have been those who have undertaken to remove or exenterate the eyes, which were affected by metastatic choroiditis. Meningitis and death, possibly, as a result of the operation, have followed this procedure in the hands of von Grafe, Knapp and Manhardt. At this period it is hardly probable that any surgeon would advocate this procedure.

The diagnosis of metastatic choroditis following septicæmia is not difficult for one who has read the classical description of Hirschberg carefully, and it is certainly not possible for any one who has ever seen the disease himself, to mistake it for anything else. The clinical picture of swollen lids, chemosis. protrusion of the eyeball, limitation of movement, together with the suppurating cornea and the history of the case, clinches the diagnosis beyond peradventure.

The prognosis in all cases is unfavorable, both for life and for eyesight. Axenfeld, in the *Monatsschrift fur Geburtshulfe und Gynaekologie*, page 516, 1895, has thoroughly reviewed the subject. The disease is apt to affect both eyes, and of sixty-three cases collected by Axenfeld, twenty-two were bilateral.

Bayer-Gimuto found that of the double-sided cases, 75 per cent. had endocarditis. Of the one-sided cases, 34 per cent. had endocarditis.

Hirschberg and Hennius state that with rare exceptions double-sided metastatic choroiditis ends in death. Of 41 cases of one-sided metastatic choroiditis, 14 recovered with life and 27 died.

The following conclusions seem warranted from a study of this affection:

(1.) Metastatic choroiditis, or suppurative panophthalmitis, may follow septic infection through the genital tract after labor.

(2.) As a rule, both eyes are affected, although one alone may be affected.

(3.) The disease first commences in the uveal tract, afterward involves the vitreous humor, and finally is exhibited in great swelling of the lids, with chemosis of the conjunctiva, and, usually, rupture of the cornea or sclera, or both.

(4.) The prognosis for sight is bad in all cases.

(5.) The prognosis for life is worse when the disease is bilateral than when it is unilateral, and is bad in all cases.

(6.) Endocarditis is present in the majority of cases.

(7.) Surgical interference is distinctly contra-indicated.

39 W. Thirty-sixth Street.

UNILATERAL REFLEX IRIDO-PLEGIA.

By William H. Wilder, M. D.

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Reflex irido-plegia, first accurately described by Argyll-Robertson, whose name is frequently given to the phenomenon, is that condition in which the pupil is inactive to light, but contracts promptly in efforts of accommodation or convergence. There may, or may not, be loss of accommodative power. The condition is almost invariably bilateral, and is frequently observed in Tabes, according to Gowers in 80%, according to Dillman 76% of all cases of the disease.

On the other hand, the unilateral form is extremely rare, and when occurring is usually dependent upon some exceptional cause, although Gowers says he has observed it in Tabes.

The following cases came under my observation, singuarly enough in the same week:

Case 1. Mrs. W. P. Aet. 28, was first seen by me April 13, 1896. She stated that the right eye was weaker for reading than the left, and that print appeared blurred and smaller with that eye than with its fellow. In September, 1894, she first noticed that the right pupil was larger than the left, which condition had not changed in the intervening eighteen months. She gave a good family history; her father and mother were both living and healthy, and two brothers and two sisters, all she ever had, were in good health. She. herself, had not been ill since the age of 11 years, when she had scarlatina, and during her married life she had had no miscarriages nor any evidence of syphilis. Her only child had died when it was three weeks old, of some infantile malady. As far as she knew her husband was perfectly healthy.

The right pupil measured 6 mm. and the left 3 mm. in diameter. The left pupil reacted promptly to light, and also to accommodation and convergence, while the right was not affected by light, but responded at once to accommodation and convergence.

R. V. = $^5/_5$ H. m. Sph. + 0.75.
L. V. $\bar{c}$ Cyl. + 0.75, 90° = $^5/_5$.

Right eye read Sn. 1 at 10 cm. with Sph. + 0.75 while the left read Sn. 1 at 18 cm. without a glass, showing some impairment of the accommodative power of the right eye.

The fundus in each eye was normal. There was no evidence of paresis of any of the external muscles of the eyeball.

Potassium iodide in increasing doses was prescribed, and I watched the case for one month, during which time there was no change, and then she disappeared and I have not seen her again.

Case 2. This case is quite similiar in many respects to the preceding one, and is that of a man 37 years old, in good health, who consulted me in regard to his right eye, presenting the following history: At the age of 19 years he had typhoid fever, and he contracted syphilis eight years ago, from which he thought he had completely recovered. With these exceptions he has never been seriously ill. About the first of April, 1896, he noticed indistinct vision of the right eye, and when I first saw him on the 15th of April the right pupil was larger than the left, measuring 5 mm. in diameter, as against 3 mm. of the left.

The right pupil does not react to light, either directly or consensually, but does so on efforts of convergence or accommodation. There is impairment of accommodation of the right, which reads Sn. 4 at 40 cm., while the left can read Sn. 1 at 11 cm. For distance R. V. = $^5/_5$; L. V. = $^5/_5$. The fundus of the eye is normal. He has noticed occasional shooting pains through the arms and a slight numbness of the right arm. The knee jerks are normal and there is no ataxia. In a dim light the right pupil does not dilate as readily as does the left, but remains of about the same diameter, 5 mm., as when exposed to the strongest illumination. This phenomenon may be plainly seen in the evening, and seems to indicate that the mobility of the dilator fibers of the iris is impaired, and consequently that the sympathetic is in some way involved together with that part of the third nerve supplying the iris and ciliary muscle.

In 1875 Hutchinson described a group of symptoms, including paralysis of the ciliary muscle and the sphincter iridis, to which he gave the name "ophthalmoplegia interna" to distinguish it from paralysis affecting the external muscles, "ophthalmoplegia externa," which is so frequently of central or nuclear origin. (Transactions Medico-Chir. Soc., London, 1878.)

He claimed that in paralysis of these isolated internal muscles of the eye the lesion probably exists in the ciliary or ophthalmic ganglion in the orbit, which receives branches from the third, fifth and sympathetic nerves and distributes these to the iris and the ciliary body.

Hosch, *Correspondenz Blatt f. Schweiz. Aerzte*, 1888, No. 4, describes five cases of unilateral irido-plegia, in all of which there existed a previous history of syphilis.

He argues that the lesion in such cases must lie in the upper part of the nucleus of the oculo-motor nerve, since in no other place do the nerves controlling the iris and the accommodation lie so close together.

Mooren observed in 1874 that a history of syphilis existed in two-thirds of the cases of one-sided paralysis of the iris and accommodation, and Alexander, who collected 28 cases, believes that it belongs to the late manifestations of syphilis, and is always of central origin. Unfortunately for the solution of this question almost no opportunities for autopsy on such cases have been had. It has been stated that in an autopsy made by Alexander on a case of unilateral irido-plegia there were found multiple foci of degeneration, which proves nothing. Hosch refers to a case of Hutchinson's, in which, at the necropsy, there were found changes in the nuclei and roots of the third nerve similiar to those seen in the roots of spinal nerves in a case of muscular atrophy.

According to the investigations of Duret, the branches of the basilar artery that supply the nuclei are terminal arteries, and it is conceivable that a narrowing or closure of one of these, either from a local endarteritis, or a minute clot or any other cause, might occasion a circumscribed area of degeneration in that part of the nucleus supplied by such a vessel.

But one clinical fact remains unexplained by the statement that all cases of reflex irido-plegia, unilateral as well as bilateral, are of central origin. The fact is that often with loss of contraction to the light, there is loss of dilatation in the dark, as illustrated in Case 2, in which the pupil remained of the same size in dim as in bright light. It would seem as if the sympathetic which supplies the dilator fibres of the iris were involved in such a case, and if so, what more likely than that the lesion is located in the ophthalmic ganglion which supplies sympathetic as well as motor fibres to the eyeball. Eales, *Ophth. Review II.* p. 225, records a case of one-sided reflex irido-plegia, caused by a blow on the side of the head, followed by extravasation into the orbit. It is hardly to be doubted that this caused pressure on the ophthalmic ganglion or ciliary nerves, and so brought on this condition. A small syphilitic deposit rightly placed in the orbit might accomplish the same result, and I am inclined to look upon the second case reported as due to this cause rather than to a nuclear lesion.

103 State Street.

A CASE OF RECURRING INTERSTITIAL KERATITIS.

By W. A. Martin, M. D.,

SAN FRANCISCO.

Recurring interstitial keratitis is not of very frequent occurrence. In my own practice and experience of eight years I have met with the single case here reported:

I was first called in consultation to see the patient in June, 1893. She was a woman, at that time 32 years of age, married, one child living, had several miscarriages (induced artificially), but no symptoms of syphilis discoverable. The family physician, a thoroughly competent man, said he had been unable, in the several years he had attended her, to find any syphilitic taint. She had had, a year or so previous, a pyo-salpinx, which had discharged through the rectum, but no other ailment of any particular significance. When I first examined her I found a deep injection of the sclera, above the sclero-corneal margin of the right eye, the irirs reacted sluggishly, the media were clear and the fundus normal. She complained of intense pain in and above the eye and of photophobia. It had every appearance of an episcleritis, but a few days later the cornea became involved and an interstitial keratitis developed which lasted several months.

The treatment was that usually pursued for such cases, namely, mercurials and iodides internally, instillation of atropine, warm applications, followed by massage with the yellow oxide ointment locally. When the patient was discharged at the end of August, the vision was $^6/_9$ + and the cornea was apparently of normal clearness.

In May, 1894, almost a year later, I was again called to see the same patient. I found the right eye in almost the same condition as when I first saw her the previous year. The process developed in the same manner, and under similiar treatment the eye was restored to a normal condition in about four months' time.

In the spring of 1895 the family physician, anticipating a return of the keratitis, dosed the patient with liberal doses of iodide of potash; whether owing to this precaution or not, there was no return of the trouble in that year.

In July of 1896, I was again called to see the same patient. I found that she had been suffering with a recurrence of the same trouble, dating from March. The cornea of the right eye was almost opaque, and as near as I could judge there was a posterior synechia involving the greater portion of the free margin of the iris. The family physician had been attending the eye, following, as he believed, the same routine treatment I had employed the previous years, not through any desire of his own, but at the request of the patient, who did not wish to incur the extra expense of a specialist. He said the trouble had progressed favorably until a few weeks before, when he had stopped the instillation of atropine for a few days. The iris had contracted, but he was somewhat dismayed to find when he renewed the atropine that the pupil would not dilate. He had not ventured on any stronger solution of atropia than eight grains to the ounce. I used mydriatics, gradually increasing the strength until I used at one time a 4 per cent. solution of atropine and at another 2 per cent. solution of scopolamine, watching the condition of the patient carefully. At the same time I massaged the eye with the yellow oxide ointment. A few weeks before I was called in, the patient had contracted whooping cough, so the family physician concurred with me that the constitutional effects of the atropine would affect that trouble favorably; at no time did she show any symptoms of atropine poisening beyond the dry throat, as I was always careful to keep it from passing through the duct. This treatment I have continued off and on for the past six months. She had to stop treatment for six weeks in October and November, during which time her uterus was removed on account of a carcinoma of the cervix. She recovered without any complications from the operation. At present the cornea is hazy, with a narrow opaque stripe passing from above directly across the center of the pupil, which interferes very much with the vision. There are two quite broad synechiæ involving about one-third of the free margin of the iris. I have every reason to believe that eventually there will be nearly, if not quite normal vision. Probably the whooping cough and the carcinoma complications have been instrumental in retarding the progress toward recovery.

A curious feature in connection with this case is that each time, and about four or five week before the eye trouble manifested itself, the patient complained of sharp neuralgic pains in the left arm and in the left side of the face. Before the first attack the left eye was quite swollen, as she said, with neuralgia. The year she escaped there were no pains in the arm. The last recurrence she predicted to the family physician an account of these pains; he was skeptical, but he said it occurred according to prophesy. It may be that it was simply a coincidence, or that the pains were also a local manifestation of a constitutional trouble.

It is not unusual in children to have an interstitial kerotitis attack the other eye a year, or longer, after the recovery of the first, but to have it recur, I might say annually, in the same eye, as in the case of my patient, must be extremely rare, as thus far I have been unable to find any similiar case reported in the literature to which I have access.

302 Stockton Street.

INTRA-OCULAR MYOTOMY.

BY AUGUSTIN PRICHARD,
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Fifty years have passed away since I first operated on the eye as assistant surgeon to the Bristol Eye Dispensary, and a most interesting history might be written descriptive of the many great changes that have taken place during this long period, not only in the number and nature of the operations, and the general treatment of eye diseases, but actually in the diseases themselves. At that time the operation for strabismus, which I had so often seen performed by Dieffenbach, at his clinique in Berlin, had become established, and before long iridectomy was brought forward as a cure for glaucoma, a disease which had up to that date proved practically incurable, and it encountered at first a certain amount of opposition and much incredulity as to its beneficial effects, even from some of the highest ophthalmic authorities. Before that time we were accustomed to perform a similar operation, almost always with much success in the case of closed pupil, which resulted from injury, or iritis, or sometimes after cataract extraction, without any reference to the question of tension of the eyeball; and I think the cases of closed pupil, requiring this procedure, were much more common at that time than they are now; and soon afterward the operation of intra-ocular myotomy, or the division of the ciliary ligament. was introduced, and it is not merely to pose as a *laudator temporis acti*, but with the hope of rescuing from oblivion a valuable item of ophthalmic practice that I write these lines; for the operation was very successful in my hands, and an important help in many cases, and, from what I now hear, is not held in such high repute by the present race of ophthalmic surgeons as it deserves.

The operation is simply of one step only, from half a minute to a minute in duration, not requiring an anæsthetic, and one that may be performed on an out patient, who may return to his home afterward. The only instrument required is a very narrow little knife (what we call an "iris knife") with a blade of about an inch in length, slightly convex at the cutting edge, which is blunt and rounded for about the first third next the handle, very sharp, with a perfect point and with the straight back rounded and thick enough to be quite strong.

The surgeon, standing behind the seated patient, supports the head, raises the upper lid and steadying the eyeball, as in the extraction of cataract by an upper section, for a speculum wound be quite inadmissible, with the back of the knife close to the cornea, causes the point to enter the globe at the distance of about a line from the lower margin of the cornea and downward through the iris close to its ciliary border, into the space between the edge of the lens and the sclerotic and then by pressing forward the little knife against the sclerotic, until it partially cuts its way through the ciliary muscle must necessarily be divided. Before the instrument is withdrawn it should be very slightly rotated to stretch open the little wound and allow a free escape of the collected fluid, aqueous huomr, and any blood that may have been effused. Sometimes there is a very free flow of clear water, and I have more than once known it escape in a jet on account of the great tension of the eyeball, and sometimes there is a little bleeding for a short time. The wound should encroach on the sclerotic to a small extent, and afterward the eye should be very lightly bandaged and the patient kept in a darkened room for a day or two.

For the beneficial results of this neat and simple little operation in cases of disease of the posterior half of the eye, I think we may claim almost as much as iridectomy does. When the latter operation was first introduced it was much overdone, for the results in glaucoma were so surprising and so satisfactory that some ophthalmic surgeons seemed, by this practice, to imagine that it could cure anything. It is now much more restricted; and although the success of cataract extraction, when iridectomy is first performed, is almost complete, yet I believe that the removal of the tension of the eyeball has nothing to do with the good result, which I consider due to the easy delivery of the cataract through the enlarged pupil and the impossibility of contraction in the event of any inflammation of the iris coming on. All my cataract-extraction cases were performed in the old style, without anæsthetics, with a Beer's triangular knife, making an upper or lower flap of the cornea, according as the right or left eye was operated on; and it happened occasionally that the edge of the iris slipped before the knife and could not be dislodged, and was accordingly shaved off on completing the corneal section. In those cases I always had very little anxiety as to the result, for I knew that they would turn out well, as far as the sight was concerned, but with a deformed pupil. At one of the meetings of the Ophthalmological Society of the United Kingdom, of which I was one of the first vice-presidents, while this question was being discussed, the president, the late Sir Wm. Bowman, said to me, "There is always something to be said in favor a central and circular pupil."

To return to our subject, the operation of intra-ocular myotomy; as in iridectomy the most striking results are, perhaps, in cases of acute glaucoma, some one or two of which I will briefly narrate as a sample of the effect of the operation in my hand, and there are other results to be noticed.

One of the first cases in which I tried this plan was a poor woman, blind in one eye, with what at that time we called "amaurosis." She was under various local and general treatment for sometime, on this account, when the sound eye became suddenly dim. The pupil became dilated and fixed, but without the glistening green hue of glaucoma, and she complained of extreme pain in the side of the head. We tried the usual routine in such cases, viz., blisters, mercurils and iodides and the strong Vin. Opii. dropped into the eye, without any result except that she grew gradually worse, and as no treatment gave relief I determined to try this new operation, and accordingly went down to a poor little house in the suburbs where the patient had a room, and performed myotomy and left her. We saw nothing of her for some weeks, when she presented herself at the dispensary, but so altered that I did not recognize her as the same person. She could see well, and the change in her appearance showed the difference between the vacant look of a blind person and the active expression in the eye of one who sees.

In the year 1868 I removed the left eye of a young man on account of injury and sympathetic ophthalmia; and his right eye was at that time affected with a closed pupil and the bulging and thickening of the sclerotic round the margin of the cornea, known and described, particularly in the German ophthalmological works as *Staphyloma Coporis Ciliaris*, and he could just discern the light. His condition became worse, and merely with the view to relieve the tension and pain I performed a myotomy, and he went back to the Union Workhouse, and when he returned after a considerable space of time, the eye had a much healthier look, and, what is most noteworthy, *the staphyoma had disappeared*. I afterward removed a piece of the iris so as to make a pupil, and he regained sight enough to see the objects about him, but not enough for any work,

An interesting and important result of this operation is the mode by which a recurrence of the disease is prevented. The healing of the little wound at the junction of the cornea and sclerotic and iris does not usually result in a very firm cicatrix, and the conjunctiva makes a very thin cover over it; consequently, if there is a tendency to the accumulation of the fluid it usually forces its way through, forming first a little bladder under the conjunctiva, which gives way and pours out the collected water freely. I have known this to occur periodically with much relief to the patient, the eye having been uncomfortable and a little inflamed for the previous day or two; and in this way tension was relieved and sight preserved.

Another result of this operation is of peculiar interest, namely, its beneficial effect consequent on the sympathy between the two eyes, and of this I am so convinced that I have many times operated on a sightless eye in order to check the progress of disease in the other; and have had an encouraging amount of success. The following case is an example: A maid servant, who had lost one eye completely by recurrent iritis, which had resisted all general and topical treatment except operation, came under my care with a similar condition in an acute form in her hitherto sound eye, and although she had suffered only for a few days the sight had become extremely dim. I applied the usual treatment but without much avail, and then divided the muscle in the sightless eye. Much fluid escaped and the next day she said she was better; there were no more outward symptoms and the recently affected eye responded to the treatment and her sight was at last completely restored, so that she could read and follow her employment with comfort.

I might multiply cases of this kind which are of much pathological interest in connection with the subject of sympathetic ophthalmia, but I hope I have written enough, not only to show my appreciation of intra-ocular myotomy, but to induce the present and the coming race of operating ophthalmic surgeons to give it a trial in suitable cases, if they are not already in the habit of using it; and it would please me much to hear of their success.

TWO CASES OF ENUCLEATION IN PANOPTHHALMITIS.

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The questions of most importance in ophthalmology, as elsewhere, are mainly those of a practical character, and foremost among them is the one whether enucleation of the eyeball in panophthalmitis is ever justifiable? It is to sustain the argument that, under certain limits, such procedure is not only justifiable but even desirable, and the best practice to which we can resort that the following two cases are reported. So far as two cases can go to prove anything they go to show the truth of this assertion.

They are only selected as two recent ones, but are by no means the only ones in which the writer has put such confidence in this position as to practice the operation.

The postulate that the operation should never be done in the active stage of panophthalmitis has, we think, unfortunately, been too generally adopted.

Thus Dr. Joseph A. Andrews, who is himself a partisan of the operation, in an excellent paper on "Enucleation of the Eyeball During Purulent Panophthalmitis," (N. Y. *Medical Journal*, December 29, 1888), reports twelve consecutive enucleations of the eyeball during purulent panophthalmitis, in all of which the course of recovery was uninterrupted by unfavorable symptoms, and shows that nearly all the authorities which he quotes were opposed to it, and that all the text books on ophthalmology voice the warning of von Graefe against the enucleation of an eyeball, which is the seat of acute purulent panophthalmitis.

For all this, and rightly too, we think, he takes exception to this generally accepted dogma. It is not my intention to go over again the ground he has already traveled, in quite a masterly way, but to those who wish for more convincing proof of the soundness of the position for which we contend we refer to his article.

He has collected in tabular form all the cases of death (at the date of his publication) following enucleation 36 in number and points out the important fact that meningitis and death have followed in the wake of purulent panophthalmitis when enucleation has not been performed, and that it has followed two enucleations, in which the globe was not the seat of purulent inflammation, but death when it did occur in such cases was due to purulent meningitis from infection of the orbital wound at or shortly after the operation.

Leaving then for the moment these considerations we beg to publish in support of such practice our cases:

CASE 1. J. G., a young man of 22 years, came to my office on Feb. 7, 1896. Three days before, while striking a chain with a cold chisel a piece of steel or iron flew from the chain and struck him on the left eye. The accident happened in the morning, and in the afternoon of the same day he went to the Manhattan Eye and Ear Hospital, where he was seen by one of the surgeons, who did not think the foreign body had penetrated the eye and consequently allowed him to go without any measures to remove it. In the evening the eye became very painful and the severity of the pain rapidly increased, at the same time the lid began to swell and the eye became very red. When seen by me there was great swelling of the lids, especially the upper one, intense ocular chemosis, especially downward and outward, where the conjunctiva protruded between the palpebral fissure. By focal illumination a small penetrating wound was to be seen in the upper outer part of the cornea, a little to the outer side of its vertical meridian. Its margins were purulently infiltrated and a small bead of pus protruded therefrom.

The pupil, iris, and anterior chamber were purulently infiltrated. He was suffering from the most severe supra-orbital pain; had not slept at all through the night. There was gastric disturbance and nausea, and his temperature was $99^1/_5$°. The same afternoon the eye was enucleated under ether, at the New Amsterdam Eye and Ear Hospital. The operation was very difficult indeed, on account of adhesion of the eyeball to the underlying tissues, and had to be done slowly to avoid puncturing the globe. There was a good deal of hemorrhage, and it was impossible to completely return the conjunctival stump into the orbit. A pressure bandage was firmly applied and the patient put to bed. Throughout the operation careful use was made of antiseptic precautions, and a solution of bichloride 1-500 employed to irrigate the wound. He was seen the next morning at 8 o'clock. Had slept all night, had no pain, but there was very considerable tense, brawny swelling of the lids, and the conjunctiva protruded from between the lids. In the afternoon temperature was 99° F, pulse 60. Felt well, had a good appetite, swelling of lids and conjunctiva the same. Wound carefully irrigated with bichloride solution and a firm pressure bandage applied.

Feb. 9th, 3 p. m., temperature $99^1/_5$° F., pulse 70, had not slept so well; less swelling of the lids, the upper one begins to show natural wrinkles; the purulent discharge less. From this time on he rapidly recovered. His temperature became normal, and on Feb. 14th he was discharged with a good stump. The eye was opened immediately after the operation by an equatorial section.

The whole anterior part of the globe was filled with, and the anterior part of the vitreous streaked with pus, in the densest part of which laid the foreign body, a small, very sharp, angular piece of iron or steel about 5 or 6 mm. long.

It might have been removed by an electro-magnet if its presence had been determined, or even suspected, before suppurative inflammation had occurred.

Case 2. On the afternoon of July 4, 1896, I was asked to see, in consultation with Dr. Helm of Sing Sing, a man 39 years of age, who had been injured two days before by a potato which had been thrown at him, and which struck his right eye with great violence.

He was then suffering the most intense pain in the eye. The lids were somewhat swollen; the eye was very red; the ocular conjunctiva chemotic; the character of the chemosis such as to suggest a parenchymatous infiltration, somewhat like that seen in diphtheritic conjunctivitis. There was a deep-seated central opacity of the cornea, preventing ophthalmoscopic illumination, anesthesia of the cornea, $+ T_3$ and only bare perception of light. The next morning I made a broad upward iridectomy with a Graefe's knife, under ether, in the Sing Sing Hospital, and left the patient under the care of Drs. Helm and Minor. His pain was immediately relieved, but his vision did not return. Contrary to all advice he left the hospital too soon, and went to work in the field, in the hot sun, with his eye uncovered.

At this time I left for my vacation and heard no more of him until my return, when I heard that he had come to the New Amsterdam Eye and Ear Hospital on August 15th, with panophthalmitis. Enucleation under ether was done by Dr. J. Herbert Claiborne. The enucleation was very difficult on account of numerous dense constrictions between the orbital tissues and the ball. Strict antisepsis with a solution of bichloride 1-4000 was employed. The patient made a quick recovery, and was discharged after three days with a good stump.

The globe was opened at once and the suppurative process was found to be limited to the anterior part of the vitreous, which was streaked with pus.

Here, then, we have two cases of purulent panophthalmitis, in which enucleation was made after the purulent process was well established, in each of which a speedy and uneventful recovery took place. In one of them, indeed, the slight febrile and constitutional symptoms which had already developed immediately improved. One of the most forcible arguments for making enucleation, it seems to me, is that the patient is at once relieved from pain, which is so agonizing in character, and if, as is usually the case, he is a working man, is at once able to resume his occupation.

It was stated at the begining of this paper that we favor, under certain circumstance, this procedure. The limitations are, in our judgment, then: First, when the purulent process has reached too great a height, for then the operation becomes almost practically impossible on account of the great swelling of the lids and the conjunctiva, and we are obliged to leave the process to nature, or content ourselves with making incisions into the globe to evacuate the pus and relieve the pain. It is conceivable, too, that at the very height of the purulent inflammation, when not only the tissues of the eye are full of pus, but when there is purulent infiltration of the tissues of the orbit as well, we may incur some danger in enucleation. Second, when the purulent infiltration begins from behind instead of from the anterior part of the eye, as in septic irido-choroiditis, there is much more danger in performing enucleation, because of the close proximity of the process to the optic nerve, and the consequent increased liability of its extension through the nerve sheath to the brain.

We would, therefore, express it as our conviction, that in all cases of panophthalmitis, which begin by the invasion of the anterior parts of the globe, if the disease has not reached too intense a degree, enucleation is the best and even the safest treatment. In cases of metastatic origin it should be avoided.

In concluding these desultory remarks, already much longer than we intended them to be, we would refer those who may be interested to the much fuller detail of all the questions involved, both *pro* and *con*, to the elaborate paper of Dr. Andrews, to which reference has here been made.

A NEW CLASSIFICATION OF THE MOTOR ANOMALIES OF THE EYE, BASED UPON PHYSIOLOGICAL PRINCIPLES.

THE PRIZE ESSAY OF THE ALUMNI ASSOCIATION OF THE COLLEGE OF PHYSICIANS AND SURGEONS, NEW YORK, FOR 1896.

By Alexander Duane, M. D.,

NEW YORK.

Part 2. Pathology

VIII. Anomalies of Divergence. Hypokinesis.—Divergence-Insufficiency. Signs. Etiology. Idiopathic and Secondary Divergence-Insufficiency. Differentiation of the Two Forms. Course. Symptoms. Treatment. —Hyperkinesis. Divergence-Excess. Signs. Etiology. Primary and Secondary Divergence-Excess. Differentiation of the Two. Course. Symptoms. Treatment.

IX. Anomalies of Sursumvergence. Hypokinesis. Sursumvergence-Insufficiency. — Hyperkinesis. Sursumvergence - Excess. Sursumvergence-Hyperphoria and Vertical Strabismus. Peculiar Cases; Anatropia and Catatropia.

X. Anomalies of Rotation Movements.

XI. Recapitulation. Nature of Outward, Inward and Vertical Deviations (Exophoria, Esophoria and Hyperphoria). Varieties of Each and Their Differentiation.

VIII.

ANOMALIES OF DIVERGENCE.

Hypokinesis. Divergence-Insufficiency. Weakness of the diverging power (Divergence-Insufficiency) is characterized by the following signs:

For Distance.—Esophoria of varying amount (usually 2°–8°), by all tests (phorometer, screen, and parallax). Associated lateral movements normal. Diverging power very much reduced, the reduction being often proportionate to the degree of the esophoria (*e. g.*, with an esophoria of 3° or 4°, the diverging power is about 4°, and with an esophoria of 5° or 6°, the diverging power is only 2°). In the typical cases of this anomaly, however, the diverging power is disproportionately low, being, for example, only 2° or 3°, when the esophoria is 1° or 2°, and being, perhaps, only 3° or 4° when there is orthophoria or actual exophoria for distance. Exercise of divergence with prisms, base in, is sometimes associated with a sense of decided muscular strain.

Prism-convergence (adduction) normal, or often somewhat deficient. Exercise of the convergence often gives rise to a temporary homonymous diplopia, and the latter may also in some cases (particularly when the diverging power is much reduced) occur spontaneously, or be evoked by simply placing a red glass before one eye.

For Near.—Signs, unless the condition is associated with a convergence-insufficiency, or with a convergence-excess, fairly normal (*i. e.*, slight esophoria or exophoria, and convergence near-point at about the proper distance).

In its *origin* divergence-insufficiency is either idiopathic or secondary to a convergence-excess.

Uncomplicated *idiopathic* divergence-insufficiency is comparatively rare, and, moreover, some of the cases that would seem to fall in this category are probably either really secondary to some disorder of the vertical muscles (elevators or depressors), or are examples of a spurious divergence-insufficiency, *i. e.*, of a condition in which there is actual weakness of the externi themselves, either natural or produced by operation. In cases of the latter kind the divergence is indeed weak, but the power of making lateral movements is also lessened, and hence these cases do not fairly come under the head of a simple impairment of the diverging function.

Complicated idiopathic divergence-insufficiency is more common. In these cases there is either a convergence-insufficiency, which has developed simultaneously with the disorder of divergence, or there is a convergence-excess, which is the result of the latter.

Secondary divergence-insufficiency develops in the manner already described (see Section VII.) from a progressively increasing convergence-excess. Cases of this sort might be confounded with those of the foregoing category, *i. e.*, those in which a primary divergence-insufficiency is followed by excessive convergence action. The distinctive points between the two may be stated as follows:

PRIMARY DIVERGENCE-INSUFFICIENCY, WITH SECONDARY CONVERGENCE-EXCESS.	PRIMARY CONVERGENCE-EXCESS, WITH SECONDARY DIVERGENCE-INSUFFICIENCY.
Esophoria for distance moderate (not over 8°), and may be less than the deficiency in the diverging power (abduction).	Esophoria for distance often great, and when small usually disproportionately large in comparison with the deficiency of diverging power.
Esophoria for near small and usually less than that for distance.	Esophoria for near usually greater than for distance.
Condition stationary.	Condition often progressive.

The *course* pursued by a divergence-insufficiency is indicated in what has already been said. The idiopathic variety shows but little tendency to change, the amount of esophoria and of divergence-weakness often remaining the same for years. This variety frequently becomes complicated with a condition of convergence-excess, which, however, also remains of moderate degree. On the other hand, a divergence-insufficiency, which is secondary to a convergence-excess, is often progressive, the advance continuing in many cases until a moderate deviation is converted into a marked and constant strabismus convergens.

The *symptoms* of a divergence-insufficiency are often very troublesome. Asthenopia as a result of near work is not so much complained of, unless there is a simultaneous convergence-insufficiency, but headache and other more remote reflex pains, a sense of constriction in the head, stomach disturbance, general inertness and lassitude, and even interference with the general nutrition are often met with. Spontaneous diplopia may also occur, being, naturally, more marked for distance than for near. One peculiarity in the symptoms is that headache and pronounced asthenopic sensations (feeling of strain and tiring in the eyes), together with a sense of confusion and dullness in the head, are especially apt to be produced by looking long and intently at distant objects, particularly when moving or when brightly illuminated. Such symptoms are hence often occasioned by watching a theatrical performance, a ball-match, a procession, or a moving throng of people. (Panorama-asthenopia, or panorama-headache of Bennett.)[1]

The *treatment* of divergence-insufficiency presents many difficulties, the condition being intractable and the result uncertain.

Direct exercise of the divergence with prisms, base in, has not, in my experience, been of the least avail. Exercise by the performance of systematic lateral movements of the eyes seems unphysiological, inasmuch as it is the externi that are thus practiced, and not the function of divergence *per se*, and, moreover, in these movements the interni are practiced along with the externi. Some, however, seem to have obtained good results by this method.

The constant wearing of prisms, base out, is in most cases a dangerous expedient, as tending to cause disuse and a consequent further enfeeblement of the abducting power.

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[1] ANNALS OF OPHTHALMOLOGY, January, 1897.

If an operation is resorted to, it should, in the idiopathic cases at all events, be an advancement of the externi rather than a tenotomy of the interni. The latter operation by itself is almost always nugatory, the condition tending, after a temporary period of improvement, to return to its original state. Moreover, the tenotomy, if thorough enough to be efficacious, is liable to substitute for the unpleasant asthenopia for distance an almost equally annoying asthenopia for near. In the secondary cases, however, or wherever a marked convergence-excess is present, tenotomy of the interni may be performed: but even then it is preferably combined with advancement of the externi.

Hyperkinesis. Divergence-Excess. Over-action of divergence (*Divergence-Excess*) is marked by the following signs:

For distance. Exophoria, usually marked (from 4° upward) with noticeable deviation out behind the screen. Associated lateral movements normal. Diverging power excessive (over 9°), the excess over the normal amount of 6° or 8° being often roughly proportioned to the degree of the exophoria, but sometimes being disproportionately larger. Prism-convergence (adduction) in uncomplicated cases normal, although possibly performed with difficulty at first. Crossed diplopia for distance often occurring spontaneously, or producible at will.

For near. Conditions, unless a convergence-insufficiency also exists, fairly normal (*i. e.*, exophoria less, or, at all events, not much greater, than for distance, and near point of convergence about in its normal situation).

A divergence-excess may either be primary in *origin* or be secondary to a convergence-insufficiency.

Primary divergence-excess occurs not infrequently as an uncomplicated affection, but still more often is associated with a vertical deviation (which may really stand in genetic relation with it), or with a consecutive convergence-insufficiency, It may also be associated with a convergence-excess. I have observed several instances of this latter combination, in which with exophoria for distance and a high diverging power, there was also excessive power of convergence, and either actual esophoria for near, or at least an exophoria slight in amount, and much less than that for distance.

The development of a *secondary* divergence-excess from a convergence-insufficiency has already been traced (see Section VIII). These cases, like the simple ones of convergence-insufficiency which represent only a less advanced stage of the same process, often show complicating insufficiency of the vertical muscles. Indeed, as before remarked, this last-named condition would seem to constitute the real cause of the divergence which takes place, first for near and then for distance.

The differential points between a primary divergence-excess with a secondary convergence-insufficiency and a primary convergence-insufficiency with consecutive divergence-excess are as follows:

PRIMARY DIVERGENCE-EXCESS WITH SECONDARY CONVERGENCE-INSUFFICIENCY.	PRIMARY CONVERGENCE-INSUFFICIENCY WITH SECONDARY DIVERGENCE-EXCESS.
Exophoria about equal for distance and near.	Exophoria for near much greater than for distance.
Converging power and prism-convergence not excessively affected.	Converging power greatly affected.
Recession of convergence near-point moderate.	Recession of convergence near-point marked.
Condition shows little tendency to progress.	Often markedly progressive.

As above stated, cases of primary divergence-excess show but little tendency to progress. I have had one such case under observation for over nine years, in which the divergence, although large, has shown but moderate fluctuations—indeed, may be said to have remained practically unchanged— during the whole time. Cases, on the other hand, of secondary divergence-excess are often progressive, a moderate degree of exophoria developing gradually into a marked divergent squint.

The *symptoms* presented by a case of divergence-excess are frequently slight. The most troublesome are those due to an associated convergence-insufficiency, and, if this is absent, the patient may complain of nothing except possibly of a spontaneously occurring crossed diplopia for distance, or of the deformity occasioned by the noticeable deviation of the eyes. Headache and asthenopia may, however, also occur.

The *treatment* of a divergence-excess will be addressed mainly to the correction of the refraction and to the relief of an associated convergence-insufficiency. If an operation is performed, tenotomy of the externi may be done; but it will often have to be supplemented by systematic exercise of the convergence and even by advancement of the interni.

IX.

ANOMALIES OF SURSUMVERGENCE.

Hypokinesis. Sursumvergence-Insufficiency. It is not certain whether sursumvergence, *i. e.*, the separation of the visual lines in a vertical plane, is ever performed by the eyes in the execution of normal movements. It seems, however, likely that some such action may be serviceable incidentally in the act of elevating or depressing the eyes. If so, great impairment of the sursumvergence would constitute a serious deficiency. As far as I have seen, however, limitation of sursumvergence appears to have no special injurious effect.

Those who regard the amount of sursumvergence as a measure of the strength of the elevators and depressors (which it surely is not) lay more stress than I have done on the limitation of this function, and recommend systematic exercise of the latter by means of prisms, base up or down, in cases where it is subnormal. I have had some experience with these methods, but not enough to enable me to speak with assurance as to their value. My results, such as they were, have not led me to expect much from training of this sort.

Hyperkinesis. Sursumvergence-Excess. Excessive power of sursumvergence is observed in many patients affected with hyperphoria and particularly in myopes who have an artificial hyperphoria from wearing ill-fitting concave glasses. The latter, as they shift in various positions, produce prismatic effects changing in degree and in direction, and hence requiring a variable effort to overcome the diplopia to which they would naturally give rise. This constant exercise gives rise often to a considerable increase in the power of sursumvergence, the latter sometimes attaining 10° or more.

A true *sursumvergence-excess*, *i. e.*, a state of habitual divergence of the visual lines in a vertical plane, due to excess of sursumvergence action, constitutes one of the varieties of hyperphoria, and probably accounts for some of the cases of strabismus sursumvergens and strabismus deorsumvergens. These cases must not be confounded with a similar vertical deviation due to paresis or insufficiency of some of the individual muscles. The differential diagnosis between the two will be established by making the screen and diplopia tests in different portions of the field of fixation, when, if there is an insufficiency of any individual muscle, a deviation or a diplopia, showing a characteristic increase in some one direction of the gaze, will be found to exist (see Section VI).

In sursumvergence-excess either the right or the left visual line may be habitually higher than the other *(right* and *left hyperphoria)*, or each alternately may be higher *(alternating hyperphoria)*. If the deviation is considerable and not habitually overcome, the condition is known as a vertical squint *(hypertropia)*, which again is called right or left hypertropia, according as the right or the left visual line is above. Vertical squint is also classified into *strabismus sursumvergens* when the lower eye is the one that habitually fixes, and *strabismus deorsumvergens* when the upper is the fixing and the lower the non-fixing eye.

Regularly, in such cases, the deflection follows the law of associated movements. That is, if the right eye deviates up behind the screen when the left eye is fixing, the latter will, when the screen is shifted so as to cover it, move down in company with the right, which now, being uncovered, is descending in order to get into the position of fixation. In certain remarkable cases, however, the *deviation of both eyes* is up *(anatropia)*, or of both eyes is down *(catatropia)* behind the screen. That is, if the right eye deviates up behind the screen when the left is fixing, the latter, as soon as the screen is shifted and the right eye moves down to get into the fixing position, will move up. In this case the visual lines, instead of remaining at a constant angle, as in the case before cited, will approximate until they become parallel, and will then diverge in the opposite direction.

Stevens *(Annales d'oculistique*, CXIII., 3, April, 1895,) was the first to carefully study these cases and call them by the names above given.[1] His view of them is that they are due to the fact that initial elevation or initial depression of both visual lines (*i. e.*, an excessive sursumversion or deorsumversion) is, in these anomalous cases, the natural state, to which each eye tends to return when not used for vision. But the condition may also, and perhaps more plausibly, be ascribed to a spasm of sursumvergence, or rather of the action opposed to sursumvergence (that, namely, by which the visual lines, when vertically diverged, are brought together again).

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[1] Schweigger, to be sure *(Arch. f. Augenheilk.*, XXIV., 3-4, 1894), mentions such a case, but without attempting any explanation of the phenomenon.

X.

ANOMALIES OF ROTATION-MOVEMENTS.

Anomalous conditions, in which divergence or convergence of the vertical meridians of the two corneæ (other than the physiological divergence which occurs when the visual lines are converged) have been described by Savage. His views, however, although urged with much plausibility, are still far from being demonstrated. It seems likely that these conditions, if they exist at all, are rare and of comparatively little significance.

XI.

RECAPITULATION.

The conditions that I have sketched embrace all the different deviations, both manifest and latent, that are usually described. As the system of classification here proposed differs radically from that generally employed, it may be well, in a brief recapitulation, to show the points of contact between the two.

The ordinary classification divides deviations into Outward (or divergent), Inward (or convergent), and Vertical (upward or downward).

These deviations may be due to the following causes:

SUMMARY OF DEVIATIONS.

I. Inward Deviations (Esophoria, Convergent Strabismus) may be due to:

a. Over-action of one or both internal recti or of the other adductors of the eye (superior and inferior recti).

b. Under-action of the external rectus or of the other abductors (the obliques).

c. Under-action of the center for producing divergence movements (divergence-insufficiency).

d. Over-action of the center for producing convergence movements (convergence-excess, which, in turn, may or may not be due to excessive accommodative action).

e. Two or more of the above causes combined.

II. Outward Deviations (Exophoria. Divergent Strabismus) may be due to:

a. Under-action of the internal rectus or of the other adductors (superior and inferior recti).

b. Over-action of the external rectus or of the obliques.

c. Under-action of the center for producing convergence movements (convergence-insufficiency, which, in turn, may or may not be due to insufficiency of accommodative action.)

d. Over-action of the center for producing divergence movements (divergence-excess).

e. Two or more of the above causes combined.

III. Upward and Downward Deviations (Hyperphoria, Strabismus Sursumvergens and Deorsumvergens) may be due to:

a. Over-action of an elevator or depressor muscle.

b. Under-action of an elevator or depressor muscle.

c. Both of the above causes combined.

d. Sursumvergence-spasm, either uncomplicated or combined with under-action or over-action of an elevator or depressor.

IV. Mixed Forms (Hyperphoria combined with Exophoria. Hyperphoria combined with Esophoria, and Esophoria in one part of the field of view combined with Exophoria in another) are frequent.

The *differentiation* of these separate groups included under the above general heads is readily made, for all have well-marked signs which are detailed in the foregoing sections (V.–VIII.). The diagnosis, indeed, can in almost every case be made at once by applying the three broad principles laid down in Section IV. (at the end of the remarks upon comitant and non-comitant deviations).

The diagnostic points indicative of the chief conditions met with are recapitulated in the following table.

DIAGCOSTIC TABLE—TERMS EMPLOYED.

Pc (convergence near-point). the distance of the near-point of convergence from the bridge of the nose. when the object of fixation is carried toward the eyes in the median line.

Pc (R). the distance of the near-point of convergence from the bridge of the nose when the object of fixation is carried directly toward the patient's left eye from some point situated to the front and right of him (see Fig. 3 and accompanying explanation). Pc (R) will, in this case, denote the point at which the right eye sags off in convergence. Similarly, *Pc (L)* denotes the point at which the left eye ceases to converge when the object is carried from the left side directly toward the right eye.

Convergence-adduction. the power possessed by either eye of moving inward in response to a convergence-stimulus. Its measure is the Pc.

Associated adduction. the power possessed by either eye of moving inward in performing associated parallel movements, *i. e.*, when the other eye is moving outward. It is regularly greater than the convergence-adduction.

Prism-convergence (the adduction of most) is the ability to converge the eyes. when overcoming prisms. base out.

Prism-divergence (the abduction of most authors) is the ability to diverge the eyes as measured by the degree of prism, base in, which the eyes can overcome. This is said to be *proportionate* to the amount of an exophoria or esophoria when it equals 7 + the exophoria or 7 — the esophoria (for distance).

A. OUTWARD OR DIVERGENT DEVIATIONS.—(EXOPHORIA, DIVERGENT SQUINT.)

I. Deviation and its evidences (exophoria. crossed diplopia) noticeably greater in some directions of the gaze than in others. Pc abnormally remote. Pc (R) greater or less than Pc and still more so than Pc (L). Excursion of one eye and its field of fixation abnormally increased or reduced in some one direction. both for distance and near. **Under-Action of an Adductor or Over-Action of an Abductor Muscle.**

NOTE—The diagnosis as to whether it is under-action or over-action that is present may be made from the points detailed under the head of diagnosis (4) in Section V.; and the specific diagnosis of the muscle affected may be made from the tables of diplopia in same section (6). As there stated, a crossed diplopia (or an exophoria) which increases as the eyes are carried to the right indicates weakness of *some* muscle of the left eye or over-action of *some* muscle of the right eye; and any exophoria which changes markedly in degree as the eyes are shifted can be due only to under-action of an internus or over-action of an externus.

II. Deviation and its evidences (exophoria, crossed diplopia) sensibly the same in all directions of the gaze. Pc (R) equals Pc (L). Excursion of both eyes and their fields of fixation normal (at least for distance).

(a.) Deviation or exophoria slight for distance. Marked for near by all tests. Pc abnormally remote. Convergence-adduction less than associated adduction (Graefe's test—see Section VI.). Prism-divergence not specially great (usually 8-10°, or may be subnormal). Prism-convergence subnormal and effected with difficulty. **Convergence-Insufficency.**

NOTE.—The diagnosis between an *accommodative* and a *non-accommodative* convergence-insufficiency will be made by reference to the etiology (see Section VI.) and by observing the effect of glasses. The latter, if suitably adjusted, usually relieve a trouble of purely accommodative origin.

(b.) Exophoria marked for distance; less for near (relations for near may be nearly normal). Pc normal, or nearly so. Prism-divergence large (in typical cases disproportionately so; *i. e.*, it is greater than 7° + the exophoria for distance). Prism-convergence often normal and effected with facility. **Divergence-Excess.**

(c.) Exophoria marked for both distance and near. Pc abnormally remote. Convergence-adduction less than associated adduction (Graefe's test—see Section VI.). Prism-divergence large, but not disproportionately so, compared with the amount of exophoria. Prism-convergence usually reduced — often greatly. **Divergence-Excess with Convergence-Insufficiency.**

NOTE.—The determination as to whether the divergence-excess is secondary to the convergence-insufficiency, or is primary, may be made by the differential diagnosis given in Section VII. This condition is not always easy to diagnosticate from a comitant deviation produced by under-action of one or both interni, combined with over-action (due to compensatory contraction) of the externi. Moreover, it is not improbable that a long-continued divergence-excess may give rise not only to an insufficiency of convergence, but to a weakness of the interni *per se*, due to their protracted inaction and to the unfavorable conditions under which they work.

(d.) Exophoria marked for distance. For near, slight exophoria, orthophoria, or esophoria. Pc normal or excessively near. Convergence-adduction greater than associated adduction.

Prism-divergence large, sometimes disproportionately so. Prism-convergence normal and readily effected. **Divergence-Excess with Convergence-Excess.**

NOTE.—These cases are sometimes difficult to diagnosticate from those of anatomical preponderance of both externi (structural deviation), combined with a convergence-excess.

The convergence-excess in these cases, being often accommodative, will frequently disappear upon the use of the proper glasses.

(*e.*) *Convergence-Insufficiency with Divergence-Insufficiency.* (See Inward Deviations, B. II., d.)

III. **Mixed conditions,** in which the deviation increases more or less in certain directions of the gaze, but in which the phenomena noted under II. are likewise present (combination of over-action or under-action of muscles with a divergence-excess or a convergence-insufficiency); and conditions in which, by the weakness of some muscles and the over-action of others, a comitant exophoria or divergent squint has been established, are not readily analyzed into their constituent factors.

B. INWARD OR CONVERGENT DEVIATIONS—(ESOPHORIA, CONVERGENT SQUINT).

I. Deviation and its evidences (esophoria, homonymous diplopia), noticeably greater in some directions of the gaze than in others. Pc abnormally near. Pc(R) greater or less than Pc and still more so than Pc(L). Excursion of one eye and its field of fixation abnormally increased or reduced in some one direction, both for distance and near. **Under-Action of an Abductor or Over-Action of an Abductor Muscle.**

NOTE.—For the specific differentiation see Section V., remarks on diagnosis, (4) and (6). As there stated, a homonymous diplopia (or an esophoria) which increases as the eyes are carried to the right, indicates weakness of *some* muscle of the right eye or over-action of *some* muscle of the left eye; and an esophoria which changes markedly in degree as the eyes are shifted can be due only to under-action of an externus or over-action of an internus.

II. Deviation and its evidences (esophoria, homonymous diplopia) sensibly the same in all directions of the gaze. Pc(R) equals Pc(L). Excursions of both eyes and their fields of fixation normal (at least for distance).

(*a.*) Esophoria marked for distance; slight or replaced by exophoria for near. Pc normal. Convergence-adduction equal to or more or less than the associated adduction. Prism-divergence low (may be disproportionately so, *i. e.*, is less than 7°—the esophoria for distance). Prism-convergence normal, or often subnormal. **Divergence-Insufficiency.**

(b.) Esophoria slight for distance; more for near. Pc excessively near (less than 1 inch). Convergence-adduction may be greater than associated-adduction. Prism-divergence normal, or but slightly subnormal (never disproportionately low). Prism-convergence normal. **Convergence-Excess.**

NOTE.—The diagnosis between an *accommodative* and a *non-accommodative* convergence-excess will be made by reference to the etiology (see Section VI.) and by observing the effect of the long-continued use of glasses (or of atropine), which in most cases will relieve a difficulty of purely accommodative origin.

(c.) Esophoria marked for distance and near. Pc excessively near. Convergence-adduction equals or is greater than associated adduction. Prism-convergence low in proportion to degree of esophoria for distance, or disproportionately low. Prism-convergence normal. **Divergence-Insufficincy and Convergence-Excess.**

NOTE.—The determination as to whether the divergence-insufficiency is secondary to the convergence-excess, or is primary, may be made from the differential diagnosis in Section VII.

(d.) Esophoria marked for distance: exophoria (of more than 4° or 5°) for near, noticeable by all tests. Pc abnormally remote. Convergence-adduction less than associated adduction. Prism-convergence low. Prism-convergence subnormal and hard to train. **Divergence-Insufficiency with Convergence-Insufficiency.**

(e.) *Convergence-Excess with Divergence-Excess.* (See Outward Deviation, A. II., d).

III. **Mixed conditions,** analogous to those given under Outward Deviations III. exist, but are hard to analyze.

C. VERTICAL DEVIATIONS—(HYPERPHORIA, STRABISMUS SURSUMVERGENS AND DEORSUMVERGENS.)

I. Hyperphoria or its evidences (vertical diplopia) increasing in some one direction of the gaze.

(a.) Hyperphoria increasing as the eyes are carried upward. **Over-Action or Under-Action of an Elevator Muscle.**

(b.) Hyperphoria increasing as the eyes are carried downward. **Over-Action or Under-Action of a Depressor Muscle.**

NOTE.—For the specific diagnosis of the muscle affected see Section V., remarks on diagnosis (4 and 6).

II. Hyperphoria the same in all parts of the field (comitant hyperphoria, comitant vertical strabismus).

(a.) Due probably in most cases to under-action of an elevator or depressor, with over-action of one or more antagonistic muscle. **Mixed Cases.**

(b.) Sometimes to equal vertical divergence of the visual lines (see Section VIII). **Sursumvergence-Excess.**

CONCLUSION.

One who proposes a new classification must be prepared to defend his position by showing that it subserves some useful purpose. That this is the case with the one propounded in the preceding pages seems to me proved by the following reasons:

1. The classification is based upon physiological facts instead of mere external appearances.

2. Its divisions correspond to natural groups, distinct in nature and symptoms, and frequently requiring widely different methods of treatment.

3. The groups so made are readily distinguishable in practice by the signs they afford.

4. We can by means of the scheme here presented analyze the frequently occurring mixed forms, and from our knowledge of the nature and tendency of the component lesions determine to which of the latter our treatment shall be addressed.

GLAUCOMA; ITS SYMPTOMS, VARIETIES, PATHOLOGY AND TREATMENT.

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Illustrated.

(Continued from Vol. VI., No. 1.)

CHAPTER VI.

Etiology—(Continued).

THE THEORIES OF BRAILEY, OF PRIESTLEY SMITH AND OF RHEINDORF.

Brailey's Theory.

Between the years 1877 and 1881 W. A. Brailey, then curator of the laboratory of the Royal London (Moorfields) Ophthalmic Hospital, published a number of papers on the subject of glaucoma, and reported the examinations of a very large number of eyes generally excised for pain, ulceration, or some other complication incident to the later stages of the disease. It is interesting to follow the development of the opinions on its etiology of one so favorably situated for personal observation, and in touch with the literature of the times.

In 1877 he (1) began by examining 53 cases of which, however, 33 were secondary and can be dismissed for the present. In the remaining 20 he noted chiefly the condition of the ciliary body and the choroid, and the former he found exhibiting pathological signs in 14 cases, while both ciliary body and choroid were affected in 5, and in only 1 the choroid alone, the ciliary body being healthy. Besides, he observed in every case except 1, that the ciliary muscle, and especially its circular fibres, were atrophied, and that to a degree corresponding to the amount of increased tension, rather than to its duration. Concerning this observation Schnabel (2) wrote in 1878, "It is Brailey's great merit to have first observed and described the atrophy of the ciliary muscle. This is the only anomaly in the glaucomatous eye demonstrated hitherto by anatomical examination, which has undoubtedly a relation to the glaucoma process, and is not merely a consequence of it. It exists before the glaucoma can be clinically diagnosed, for I found it very well developed in a globe in which the increase of tension had existed for only a few hours." At this time Brailey, evidently taking the inflammatory signs in both the ciliary body and choroid for primary changes, expressed his belief that the high tension is the result of hypersecretion from one of these, and in view of the condition of the ciliary muscle suggested the presence of "some form of inflammation resulting rapidly in atrophy, whether affecting the iris, ciliary body, or choroid," while he looked upon the peripheral irido-corneal adhesion, which was commonly present, as of only secondary importance. In his continuation of the same subject in 1879, he reported the examination of 149 eyes, which had all been tested and noted as to intra-ocular tension at the time of the excision. Some of these were included in his last paper. In this he paid special attention to the ciliary muscle, and took up the subject of the *circulus arteriosus iridis major*, which appeared to him abnormal in glaucoma. He found on making careful measurements that in eyes with increased tension the average diameter of the artery was not quite twice the normal, and that its average wall thickness was about half the normal, while the ciliary muscle was only about two-thirds the normal size, except in cases of "shortest standing" in which, unlike Schnabel, he says this is not found. On the other hand, where diminished tension existed in glaucomatous eyes the condition of both was normal, which must strike one as peculiar, seeing that such eyes had probably previously suffered from increase of tension. Brailey does not connect the condition of the artery with backward pressure, because the veins are not similarly affected, neither does he look upon the ciliary atrophy as due to pressure, he having seen two cases in which it is quite localized, but he puts it down as second, in point of time, to the arterial changes In these eyes, too, the angular adhesion is common. Knies said of the dilatation and thinning of this artery before the tension is increased, as described by Brailey, that it is not constant, and that it is seen, though less often, in both normal and diminished tension; while v. Garnier (4) found diminution, instead of increase, in its diameter. The atrophy in the ciliary region at a late stage has been generally recognized. For instance, Birnbacher and Czermak (5) found it in all the seven cases introduced in their paper. Knies (6) considered atrophy and sclerosis of both ciliary muscles and processes to be common as a rapidly developed sequel to an infiltration preceding increased tension, and Treacher Collins (7) described it as a usual thing in the eyes excised for prolonged glaucoma, which are to be seen in the museum in the Royal London Ophthalmic Hospital. By the time of his next contribution in 1880 Brailey (8) had advanced the hindrance to the outflow of lymph to a position more closely approaching in importance that of increased inflow. The latter of these two elements which contribute to the causation of glaucoma is due to inflammation, or visibly increased blood supply; while the former is generally the result of the blockade at the angle, and rarely of an obstacle at the exits from the perichoroidal space; while he found "in most cases such a condition of the optic nerve as would hinder the passage of any fluids along it." He attached special importance to the early atrophy of the ciliary body, because he believed that that permits the more easy approximation of the iris and cornea, whereby the former acquires a valvular action in relation to Schlemm's canal, which is potent "under the influence of the normal or even slightly diminished flow" from the angle of the anterior chamber. Knies (6) found that the atrophied ciliary body can be pushed abnormally easily back and forward.

The above may be considered as Brailey's explanation of "anterior," while the following is that of "posterior" glaucoma, a division first proposed by the younger Desmarres, and indorsed ten years later by Wecker, Stilling, and some other authorities: In less common cases an increased secretion arises from a pathological condition "showing accumulation in the intergranule layer near the optic disc, or more often in the neighborhood of the ora serrata; besides accumulation in front of the lamina cribrosa * * * and sometimes * * * a fissure or layer of loose tissue leading to this from the intergranule layer. * * * This is consistent with a current from the outer retinal layers of the lymph channels of the optic nerve." When to this increased inflow there is superadded a hindered outflow, due to sclerosis of the optic nerve and lamina cribrosa, there is sufficient reason for an increase of intra-ocular tension. (This may be compared with Mauthner's theory.)

Brailey's next paper in 1880, which was written in conjunction with Edmunds (10), corroborates the contents of the previous one concerning the condidion of the ciliary arteries and the ciliary body, and goes so far as to assert that in all cases of primary and secondary glaucoma, with increased tension, they found sclerosis of the optic nerve and its vessels, including the central artery of the retina. Brailey's sclerosis of the nerve vessels Knies (6) believes to arise at a late stage, and to be inconstant. But Brailey and Edmunds found the nerve still inflamed and swollen, the sheaths participating, and they express their belief that in primary glaucoma optic neuritis precedes increased tension. In the locality of the angular adhesion the iris was generally atrophic, but in fresh cases they had often seen it inflamed. The manner of the production of the adhesion they further elaborated by stating that a contraction of the fibres of the ligamentum pectinatum brings the cornea and iris into apposition, which opinion is confirmed by Knies (6). In Brailey's next paper (11) he reported on 92 cases of high tension. In these the angle was generally closed, the ciliary muscle usually inflamed, atrophic, or sclerosed; the *circulus arteriosus major* very frequently dilated, and the optic nerve almost always either inflamed or sclerosed. A description follows by Webster Fox and Brailey (12) of a "case of glaucoma preceded by optic neuritis." They found the discs swollen, and in their opinion "a neuritis caused an acute inflammation of the walls of the central vessels with a resulting thrombosis of the vein:" and this inflammation spread forward to the ciliary muscle. In his last paper (13) Brailey again spoke of the angle being closed on account of forward pressure of the iris from "enlargement of the ciliary folds due to vascular turgescence," Weber's idea; whereas he had recently asserted it to arise from contraction of the fibres of the ligamentum pectinatum, in which Knies had borne him out. Whether, in the meantime, he had changed his mind or thought both correct according to stage and circumstance, I am unable to say, but he again asserted that before the advent of increased tension inflammation of the ciliary body, iris, optic nerve, and, above all, in and around the fibres of the ciliary muscle, is always present, and that along with enlargement of the ciliary folds dilatation of the circular artery takes place, which does not decrease with the atrophy and recession from the iris of the ciliary body. The changes in the choroid are not generally primary infiltration but atrophy from compression. Brailey was now less certain that the dilatation of the circular artery might not, at times, be due to obstructed circulation the result of high intraocular tension, and while he still considered the first step toward this tension to be hypersecretion, he admitted that when atrophy of the ciliary body and iris are present the angular obstruction alone is to blame.

Priestley Smith's Theory.

In Priestley Smith's opinion the causes of glaucoma in general are "extremely numerous, and include such widely different agents as rheumatism, gout, syphilis, anæmia, and many other constitutional diseases; injuries of various kinds; cardiac, vascular, and nervous disorders; neoplasms, congenital malformations, and senile changes. * * * Primary glaucoma seems to depend sometimes chiefly on systemic, vascular, or nerve disturbances, sometimes chiefly on individual peculiarities in the build of the eye, and often on a complex co-operation of several causes" (14). At the same time, by means of laborious investigations, he has been able to sustain a theory publicly broached by himself in 1879 (15), which gives to the relative development of lens and globe a most important place among the conditions which predispose to the disease and make the above named disorders potent to produce it, while in a more healthily constructed eye they might have caused nothing worse than perhaps a passing ciliary congestion. Priestley Smith began in 1880 by measuring the lenses of five pairs of healthy eyes, and later "156 lenses removed from dead subjects were examined. They belong in nearly equal numbers to the six decades of life between twenty and eighty, and in smaller number to the decade eighty to ninety. Each lens was accurately weighed, and then measured as to its volume, by means of an apparatus devised for the purpose. In most cases the linear dimensions were measured also. Opacity when present was noted. The specific gravity was calculated in each case from the weight volume." The following are the results arrived at: The "crystalline lens, so long as it remains healthy, increases in weight and volume throughout the whole of life. During the forty years between twenty-five and sixty-five years of age it adds about one-third to its weight and one-tenth to its diameter. The specific gravity appears to vary a little in individual cases, but shows no decided change with the advance of life. Lenses which are becoming cataractous are. as a rule, smaller than healthy lenses belonging to the same period of life. These are anatomical facts; physiology explains them. The lens is derived from the cuticular epiblast, and in its mode of growth is analagous to the cuticle. But its cells. unlike those of the cuticle, are not cast off as they grow old; they are laid down layer upon layer within a closed capsule, the younger fibres surrounding the older. In consequence of this unique arrangement, and in spite of the shrinking of the older cells which form the nucleus, the growth of the lens does not cease with that of the rest of the body, but is continuous unless some morbid process intervene, throughout the whole period of life. In advanced life, the process of the growth often fails. Then the shrinking nucelus tends to separate from the softer cortex, and senile cataract begins. Accordingly the lens with incipient cataract is usually smaller than a healthy lens of the same age. To this rule, however, there are perhaps some exceptions; in certain cases of the development of the cataract the softened cortex appears to swell" (16). The obvious effect of the peculiarly sustained growth of the lens. while the tissues which environ it cease to grow at the commencement of adult life or earlier, is a progressive diminution of the intervals between lens and cornea and between lens and ciliary body. If this have anything to do with glaucoma, glaucoma ought to become commoner with advancing years. After careful examination into the matter in 1000 cases of glaucoma, Priestley Smith found that not one per cent. begins earlier than the twentieth year, that its frequency increases, slowly at first, more rapidly later on, in each decade until the sixtieth year; that between sixty and seventy it is about as frequent as between fifty and sixty; that after seventy it frequently diminishes: that cases beginning after fifty are about twice as numerous as those beginning before fifty, and that the liability is more than twice as great between sixty and seventy as between forty and fifty. The reasons given by Priestley Smith for the diminished number between seventy and eighty are the unwillingness of such old people to travel. that many are in workhouses. or ill: to which might be added the probability that any patient liable to glaucoma would be attacked before that age, and be registered under one of the other decades. He also found that, on the whole, females suffer in rather larger number than males, as six is to five, though the chronic non-congestive form affects the latter rather more than the former. Priestley Smith, having shown that the liability to glaucoma increases *pari passu* with the growth of the lens, proceeded to prove that it is still farther increased when this is associated with an abnormally small globe. He found that, on the average, the size of the cornea is a fairly good index to the size of the globe. The size of the cornea he measured in 250 healthy males and in 250 females, or 1000 eyes, at all periods of life from five to ninety, with the following results: Its average horizontal diameter is 11.6 m.m., and this increases little, if any. after five years of age, but may, perhaps, diminish slightly after forty years of age; it is slightly greater in males than in females; it is the same in hypermetropic, emmetropic and myopic eyes, and even in high ametropia; "it may safely be asserted that the size of the cornea bears no definite relation to the refraction of the eye" (17); there is very rarely any difference between the two corneæ of the same individual, even when the refractions are quite different.

In primary glaucoma, in 216 eyes, the horizontal diameter of the cornea is, on the average, half a m.m. smaller than that of an average eye, therefore the globe is smaller in glaucomatous than in healthy eyes. The percentage of unusually small corneas—measuring 10 m.m. or less—is much greater in the glaucoma than in the healthy group, *e. g.*, a horizontal diameter of 10 m.m. was found nine times in the glaucoma group. *i. e.*, 4.17 per cent. of the eyes. and was not found once among the thousand eyes of healthy persons. In 1894 he asserts (18) that eyes in which the cornea is only 10 m,m. in diameter seldom escape glaucoma.

Priestley Smith also proved that the small size of the cornea is not a result of glaucoma, but preceded it.

Confirmation of the conclusions drawn from examination of the corneæ, that small eyes are more liable to suffer from primary glaucoma than large ones, is given by his *direct* measurement of the globes of 14 eyes blinded by primary glaucoma, in which he found the average diameter in every direction to be fully 1 m.m. below the normal average. But if it were found that these small eyes contained relatively large lenses his argument would be strengthened. To arrive at a correct conclusion on this point he examined his tables of measurements, and found "that the size of the lens bears no fixed proportion to the size of the globe, even at the same period of life, and that in the glaucoma group there are several instances of a large lens in a very small eye; but the measurements are too few to justify any general statement." As the best evidence he could produce, Priestley Smith gave a series of photo-zincographs of six healthy eyes arranged beside six eyes blinded by glaucoma. In the latter the following features are visible in some or in all: A small globe; a disproportionately large lens; a consequent want of space between the lens and its surroundings; a shallow anterior chamber; a closed filtration angle; an atrophied ciliary body; an excavated optic nerve. To this evidence might, perhaps, be added that of a drawing by Treacher Collins (19) of a microphthalmic eye in which the dislocated lens appears large in proportion to the size of the globe. Priestley Smith, in confirmation of his belief that microphthalmic eyes with transparent lenses are very prone to glaucoma, quotes a case examined by Hocquard and Masson (20) in which the lens was found to be much too large for the eye; or, "speaking more correctly, the eye was much too small for the lens;" a case published by Lang, concerning which Treacher Collins (21) noted that "the interior of the eyeball was filled with lens, which, in proportion to the rest of the eye, was large and more circular than usual," and observed that the same thing is to be seen in the diagrams of microphthalmic eyes published by Kundrat (22). "Evidently an imperfect development of the tunics does not necessarily affect the lens in equal degree, and this, indeed, is what we might expect from the different origin and independent growth of the latter" (23). We are apt, then, according to Priestley Smith, to have in eyes which become glaucomatous, and from the causes enumerated, an abnormally limited space, or none, between the lens and ciliary body, while the iris approximates to the cornea in an unusual degree, a condition of things easily susceptible, by a mere accentuation, of setting up the train of symptoms which together constitute glaucoma. Thus, "any disturbance which congests the ciliary processes, or displaces the lens forward, or thickens the iris, is apt in a predisposed eye to cause a dangerous compression of the filtration angle" (24): and, clinically, we find that "the common antecedents of glaucomatous attacks are exposure to cold. constipation, hunger, sleepliness, bodily and mental fatigue, heart weakness, bronchitis, hepatic congestion," (injury to the eye or its neighborhood) "in short, various conditions which disturb the circulation and tend to congest the venous system. * * * Moreover, the influences under which the milder attacks subside spontaneously are preeminently those which tend to relieve venous congestion, namely, warmth, rest in bed, sleep, purgation, food, etc." That acute glaucoma is not inflammatory in its origin was stated some thirty years ago by Sir William Bowman, more recently by Wecker and others, while the late George Critchett likened it to a strangulated hernia, which resemblance was noticed separately by Priestley Smith, and is also mentioned by Fuchs. "The suddenness with which the earlier and milder attacks appear and disappear, the fact that a drop of atropine solution can excite a violent attack in an eye which has not previously shown the slightest sign of inflammation. and that a surgical operation can at once and permanently put an end to the process, are strongly opposed to such a doctrine" (25).

The theory known as Priestley Smith's is then, in brief, that a congestion of the uvea and especially of the ciliary processes produced by any of the conditions already mentioned, and causing these to swell so as to diminish the capacity of the globe, drives away the aqueous more rapidly at the angle of the anterior chamber, and so permits of the advancement of the lens and ciliary processes which press the iris forward; the swelling also by trespassing on the limits of the perilenticular space causes an obstruction to the outward flow of lymph, which raises the pressure in the vitreous; this still further blocks the exits by more firmly sealing up the angle; a certain permanency of this situation produces, simply as the effect of prolonged contact, an adhesion between the iris and the cornea, upon which, as a result of high intra-ocular tension, the various pathological changes of the optic nerve, choroid, etc., ensue.

But while the above is a sketch of what is generally known as Priestley Smith's theory, it should be observed that he does not consider it to apply, cut and dried, to every case of glaucoma. For instance, he says (26): "Changes in the hyaloid membrane, in the stroma of the vitreous, or in the constitution of the vitreous fluid, are possible causes of diminished filtration, and, as a fact, in eyes blinded by glaucoma the vitreous is often more distinctly membranous than in healthy eyes, its septa being thickened, or coated by albuminous coagula. In some instances, however, the excess of fluid appears to collect not in the vitreous but immediately in front of it, causing a wide separation of the hyaloid membrane from the ciliary body. When the ciliary processes are squeezed between the lens and the iris, any secretion which they still emit must pass backward, and in this way the blockade must tend to aggravate itself." As will be seen when discussing glaucoma in aphakia, in aniridia, after cataract extraction, etc., many cases, which have been arrayed against the theory, have been found upon close investigation rather to confirm than to annul its general tenets.

Now, let us see what others have written on this subject. As early as 1887 Brailey (1) wrote that the cause of the closed angle is an increased flow from behind the plane of the lens, issuing somewhere between the ciliary muscle and the periphery of the lens, and that the cause must be a mechanical one, as he had seen the iris applied to the cornea without adhering to it: but he did "not think that the advance of the lens will account for it." In 1881, without mentioning Priestley Smith, but evidently with reference to his theory, Brailey (13) remarked that in no one of the specimens which he had examined did the lens exceed the normal diameter, and that in most it was considerably flattened antero-posteriorly. He had rarely seen it advanced, and the posterior chamber of the aqueous was usually of great depth. Nothing, however, was stated concerning what exact methods he employed in estimating the relative size of the lens, and it is to be noted that Priestley Smith never claims a *positive* increase in its size, and, also, that he specially states that the lens may, after excision of the eye, return to a normal position from diminuition of the pressure behind it. In the same year, and with the same lack of information concerning his methods of procedure, he declared (28) that the diameter of the lens, whether clear or cataractous, "is even somewhat below the normal at the corresponding period of life;" that after excision the position of the lens is generally normal, but sometimes advanced; and that the only cases where it is even probable that *plus* tention is due to mechanical obstruction by an enlarged lens are those in which the latter is swollen from traumatism. He stated, however, that the channels between the ciliary folds equal 75 m.m. in width at their widest part, and normally touch the lens. Fuchs (29) gives the distance between the lens and ciliary processes as .5 mm. The folds are, according to Brailey, larger in low tension than in high. He sums up by saying: "I fail to recognize in cases of primary glaucoma any obstruction to the normal outflow of fluid at the anterior surface of the vitreous sufficient to advance the lens." Brailey (30) in 1890 published a case of a girl, 18 years old, with, in the right eye, M. 12 D. and a cornea of 9 m.m. diameter, the iris absent except a narrow crescentic piece on the inner side for two-fifths of the circle, the lens *in situ* and of a diameter equal to that of the cornea, the optic disc cupped, myopic crescent, opaque nerve fibres, and T. + 1.

Natanson (31) said that, in normal place and continuity, the lens plays a very subordinate role in the pathology of glaucoma, because glaucoma may be primary in aphakial eyes, as in two with which he had met where both eyes were aphakial and both glaukomatous, and another case in which one eye was aphakial and both glaucomatous (see section on Aphakia).

Knies, in 1890, while asserting that in glaucomatous eyes the lens is not pressed forward, quoted Weber to the effect that its propulsion toward the cicatrix after an iridectomy can frustrate the benefits of the operation, and Pagenstecher to the effect that Petit's canal is sometimes widened.

Schweigger (32), in 1891, said that he did not believe that large ciliary bodies have anything to do with glaucoma, and that the crowding forward of the lens, iris, etc., against the cornea are the result of the increase of the vitreous, and not the cause of the disease. He thought also that glaucoma in aphakia witnesses against the retention theory.

Ulrich (33), in 1892, writes that before Priestley Smith's measurements of the lens can be accepted they must be confirmed by others.

Wagenmann (34), in 1892, found propulsion of the lens in each of his three cases of hæmorrhagic glaucoma.

Bitzos (35) rejected all theories which do not place the difficulty behind the lento-zonular diaphragm, because neither age nor aphakia prevents glaucoma.

H. Snellen (36) considered that in advanced life, the elasticity of the lens being gone, and the chief effect of cont action of the ciliary muscle being then merely to slacken the zonule, "the ciliary processes are thereby pressed against the lens," and as Priestley Smith says, "the lens may then move forward carrying the iris toward the cornea." Snellen believed that the zonule is sometimes abnormally lax on account of degenerative changes often associated with senile cataract, which might account for some cases of glaucoma associated with an opaque lens, even though the latter were below the normal size, as is apt to be the case. An example of such is given by Priestley Smith (37), where the lens lay almost in contact with the cornea, and probably during life brought the iris into touch with it. (See also section on Accommodation and Glaucoma).

In 1894 Panas (38) wrote, without farther particulars, that, as a result of his dissections and those of Knies, "anatomical pathology has shown us the persistence of a sufficient space between the border of the lens and the ciliary processes, and the absence of all propulsion of the lens."

Treacher Collins (7) in reviewing the anatomical conditions found in the glaucomatous eyes belonging to the museum at Moorfield's Hospital, stated that in many of the specimens the lens is rather larger than normal, or is relatively larger than other parts of the eye. In two cases the ciliary processes are in contact with the sides of the lens, but in most they are atrophied (the eyes having usually suffered for a long period before excision), though at one time they may have touched the lens. In 1894 he (39) said, "of all the theories which have been put forward to explain the increase of tension in glaucoma, that which attributes it to the obstruction of the exit of the aqueous humor from the eye, and which has been so ably expounded and supported by Mr. Priestley Smith, is the most fascinating and explains best the phenomena met with.

Bader (40), when curator in the Royal London Ophthalmic Hospital, in reporting on iridectomy operations during 1857–1859, said "glaucomatous eyes are generally small."

Brugsch-Bey reported in 1886 some independent observations made in Cairo by himself on the eyes of Egyptians. "He found," in Priestley Smith's words, "the average diameter of the cornea to be smaller than in Europeans; he found it to be smaller in eyes suffering from primary glaucoma than in healthy eyes; and he found that primary glaucoma formed a larger per centage of ophthalmic cases than is usual in Europe." He also quotes Professor Rampoldi (42) as having observed glaucoma more frequently in small eyes than in large ones.

In connection with Priestley Smith's, we may glance at a **theory advanced by Rheindorf** (43) in 1891, and founded on an observation by Samelsohn (44), who watched the color from an iron splinter in an otherwise healthy eye pass through Petit's canal to the equator of the lens, thence through the lens to the anterior pole, back to the insertion of the zonule into the lens, and out into the posterior chamber. Rheindorf thought that the lenticular sclerosis incidental to age, especially when accompanied by something similar in the zonule, acts as a sufficient obstruction to the forward flow to produce glaucoma simplex; while, when superadded to this is any local inflammation or change in the blood current, the traction which he supposes to result to the ciliary body on account of the above senile changes may be sufficient to set up the acute form of glaucoma. He asserted that if the perilenticular space were merely narrowed by enlargement of the lens or ciliary body the only effect would be to increase the rapidity of the passage of fluid in the same way that on the removal of one kidney filtration proceeds more rapidly through the other. In connection with Rheindorf's theory, it will be sufficient to remark that Samelsohn's observation is not in accordance with what are believed to be the most satisfactory explanations of the lymph paths through the interior of the eye; that it would be difficult to reconcile it with certain forms of glaucoma, *e. g.*, glaucoma before the advent of senile degenerations; and that the author of it admits that he well knows that it is hypothesis alone. He believes secondary to be quite different from primary glaucoma, and to be due to irritation of the uvea producing hypersecretion.

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CHAPTER VII.

ETIOLOGY—(Continued).

Diseased Vortex Veins as a Cause of Glaucoma.

According to some eminent authorities interference with the circulation through the vortex veins may produce glaucoma, and experiments and pathological research have been cited in support of this view. The following are the results which have been obtained experimentally by blocking the lumen of these veins.

Exner and Leber (1), after their ligature, found a quick and decided increase of intra-ocular tension; Weber (2), a temporary, though distinct increase, with congestion of intra-ocular vessels; Schnabel (3), that the fluid oozes through the channels in the sclera in which the vortex veins run, after injections are made into the vitreous in enucleated eyes; Priestley Smith (4) asserted that "ligature of the vortex veins outside the eyes may raise the pressure to twice its normal height," while he said (5) "the lymph passages which, according to Schwalbe, surround the vortex veins and convey lymph from the inner to the outer surface of the sclera, appear to have no connection either with the vitreous or the aqueous chamber. The fluid which is secreted by the ciliary processes after subcutaneous injection in living animals, and which can be traced through the chambers of the eye, by its artificial coloration, has not been found in these channels. The fluid which sometimes escapes through the vortex veins during injection of the anterior chamber in the excised eye appears to reach them through the veins of the iris; it never passes between choroid and sclera."

Schoeler (6) found that after occlusion of all the vortex veins in rabbits' eyes, with a hot iron, the appearances already found by Leber, Weber, and others, were produced with chemosis, sometimes exophthalmos, and hæmorrhage into the anterior chamber, while the ophthalmoscope revealed hyperæmia of the papilla and marked filling of the retinal veins. Yet Schoeler found that occlusion of the vortex veins gave only a very temporary increase of tension, and concluded that in living rabbits' eyes the value of the vortex veins in carrying off fluid in high tension is small, and smaller in human eyes, in which two-thirds of the fluid leaves by the angle. To use his own words: "The tying of the vortex veins produces no remarkble increase of tension."

Kuehnt (7) reported finding in 15 glaucomatous eyes constant endoarteritis obliterans, signs of meso- and periarteritis, chiefly in the retina and ciliary body, and peri- and endo-phlebitis, which changes he thought were primary.

Birnbacher and Czermak (8) found chronic hyperplastic peri-phlebitis, with consecutive endo-phlebitis, producing narrowing of the vortex veins, which they considered might cause glaucoma. Later (9), they published an account of the condition of seven eyes enucleated for glaucoma of long standing. Their most remarkable observation was that of the peri-phlebitis and endo-phlebitis in the vortex veins, the latter probably a result of the former, and producing in some cases actual obliteration of the vessel. The changes in the vortex veins, the authors thought, could not be considered secondary to the raised intra-ocular tension, but they were secondary to an inflammation of the choroid, which was also present. They quoted Schultén to the effect that the ligature of one vortex vein may raise the intra-ocular pressure. The anterior chambers were also obliterated, and the discs were cupped. Birnbacher (10), in 1890, described very fully a case of glaucoma of only a week's duration, in which he found in the eye enucleated nine hours after death changes in the vortex veins, which he thought to be mainly responsible for the glaucoma, though the angle of the anterior chamber was closed up to its extreme periphery in one-third of the circumference, and in the remaining two-thirds the iris and cornea were in contact at a little distance from the periphery. The writer (11) has elsewhere discussed this case, and it will suffice here to say that Birnbacher found inflammatory changes in the walls of the vortex veins, which were, to his mind, chiefly responsible for the glaucoma.

Vossius (12) also related a case of glaucoma with periphlebitis and proliferation of endothelium, going so far as even to obliterate the four vortex veins. The angle of the anterior chamber was not closed.

Duerr and Schlegtenda (13), when examining five eyes affected with hydrophthalmia, found indications of obstruction to the circulation through the vortex veins by pressure on the globe from the oblique muscles. (See Buphthalmia,)

V. Garnier (14) has seen in a vortex vein a peculiar condition of the inner surface narrow, tortuous, compressed, and due to the stretching and thinning of the sclera; also thickening of the intima, "compensatory to the pressure."

Knies (15) said that the periphlebitis and proliferating endothelium belong to late stages of glaucoma, and are not always present. From the supra-choroidea probably a considerable amount of fluid passes, which has not entered the vitreous through the lymph sheaths of the vessels, going to Tenon's capsule and lymphatics in the orbit. When the normal exits for fluid are interfered with much will leave the eye without entering the vitreous, and the internal membrane will then lose much nourishment.

Priestley Smith (16), who believed he had seen high tension induced through affection of the vortex veins in the early stages of suppurative tenonitis, examined two of these veins in each of 13 eyes lost by glaucoma—primary in 10 cases, secondary in 3—and, for comparison with these, the veins in 6 non-glaucomatous eyes, 3 of which were healthy in all respects. "In one case of subacute primary, and in one of secondary glaucoma the veins appeared to be partly obstructed by formations in the interior, such as have been described and figured by Czermak and Birnbacher. In several cases, both primary and secondary, the vein wall is perhaps thickened, and in some the perivascular space seems to be abolished by the close contact of the vein with the wall of the scleral channel which contains it. The close contact is present also in one of the healthy eyes. Regarded as a whole, the glaucomatous group presents, so far as my observation goes, no distinctive changes." He also suggests that any inflammatory changes which may be found in the veins would more probably be secondary than primary, especially considering the beneficial action in glaucoma of eserin and iridectomy.

Ulrich (17) examined the vortex veins in two cases of glaucoma absolutum (18), the remains of two eyes, glaucoma absolutum and glaucoma subacutum (19), one vortex vein in a case the history of which was unknown, and an eye with glaucoma hæmorrhagicum. Leaving out the last, in none did he find the endo-phlebitis described by Birnbacher and Czermak, which Ulrich considered to be due to a hindrance in the vascular system of the uvea: but, like the inflammation of the angle, this endo-phlebitis should be looked upon as only a part of the general inflammation of the uvea. Still he thought that disease of the vortex veins might be the primary cause of a certain number of cases, and added that "further observations are necessary." The writer (20) has elsewhere published an account of the examination of the vortex veins of 20 eyes enucleated for primary glaucoma. The number of the vortex veins in eleven normal eyes was in one case 4, in three cases 5, and in seven cases 6, giving an average of 5.5, and they had a close relationship to the recti muscles, being generally near but very rarely beneath them. In the tabular statement of the condition of the choroid and veins "it will be seen that in eleven of the 20 eyes the choroid showed inflammatory patches, and that nothing abnormal was found in connection with the vortex veins except in three of the eyes examined. The choroidal inflammation always consisted of small but distinct aggregations of cells between the vessels, but not in the vessels themselves, not limited to any particular layer of the tissues, and never running so into one another as to give rise to the appearance of a change affecting it throughout. In no case was the lumen of any choroidal vessel seen to be diminished by exudation pressing on it from without. The following is a short description of the pathological changes in the vortex veins of the three eyes above referred to. No. 13 shows a slight inflammation round the vein at its choroidal extremity. In this eye, as in some others examined, there were patches of inflammation in the ciliary body. No. 14 shows an inflamed patch in the wall and perivascular sheath of a vortex vein in the sclerotic, and the vein is partially filled by blood clot composed chiefly of red cells; in the wall of a vein just external to the sclerotic and close to the vortex vein (so that it might perhaps be a continuation of the latter) is a markedly inflamed patch. Inflamed patches are also found in the choroid and ciliary body. No. 16 shows patches of inflammation in the vein wall and perivascular sheath, and in the choroid; then in the lumen of the main vessel, but not in its wall, and not in any of the vessels of the choroid, are circular bodies taking on strongly the hæmotoxylon nuclear stain. They are about one-fourth the size of a nucleus, give a bright reflex from the center, and are situated in patches in the red blood clot which occupies part of the lumen of the vessel. What these bodies are I am not at present prepared to say. They may, perhaps, be some form of parasite, but are too large for any of the known cocci, and what they may signify I have been unable to discover."

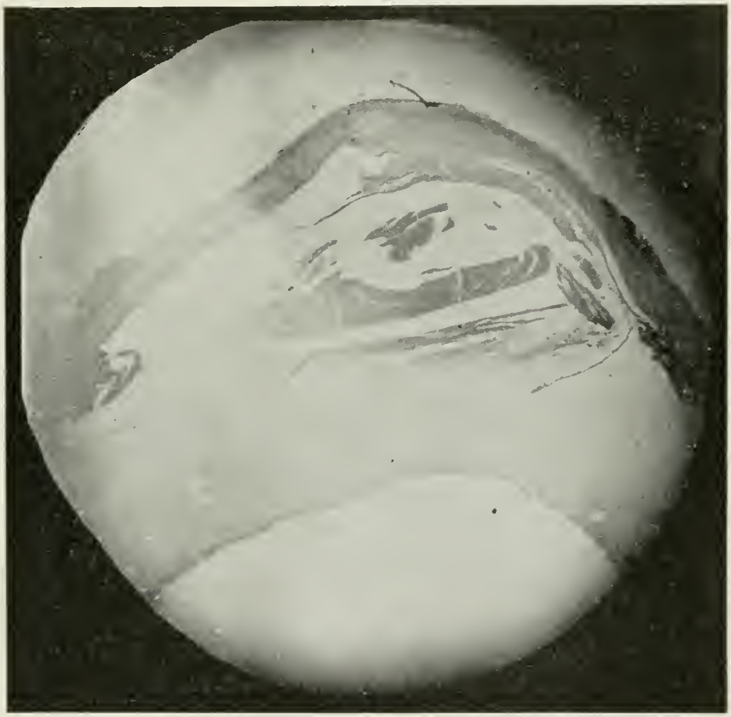

Fig. 6. Glaucoma in an Eye with Traumatic Aniridia. The whole Iris was knocked out through a wound in the Cornea: the Lens was wounded, and the Capsule adhered to the Corneal wound, resulting in a block of the ligamentum pectinatum and high tension.

In close connection with this subject is the **theory of Stellwag,** which is supported by Koenigstein (21), that the high tension, which is the important part in glaucoma, is due to augmentation of the vascular tension, general or local, assisted by a dilatation of the terminals of the arteries in the eye which prevents the easy access of the blood to the capillaries, and produces a stasis in the large capillaries and inflammation of the choroid; or, the increased intra-ocular pressure may be due to a narrowing or stoppage of the large vessels, especially the vortex veins, due to diminished elasticity and to shrinking in the sclera compressing them, faciliated by the obliquity of their passage from the eye, which is the theory supported also by Laqueur (22).

Jacobson's Theory

somewhat resembles the last. It is that glaucoma depends on a venous hyperæmia and stasis, especially in the anterior part of the choroid, due to diminished arterial pressure or senile degeneration of the vessels preventing the proper exit of the blood from the eye, with the result that Cloquet's canal and the vitreous "receive the products of the disease process," and high tension is set up.

In reviewing the work that has been done in connection with the vortex veins it must be admitted that insufficient authority has been produced upon which to construct a theory applicable to most cases of glaucoma, when one takes into account the results of ordinary treatment which, so far as we can see, can have only a very limited effect on such conditions of the vortex veins as have been brought forward as a cause of the disease, but which are really in all probability secondary changes. At the same time, it is evident that primary inflammatory affections may occur in these as in other veins, and that in such an event the subsequently swollen condition of the uvea would supply at least one of the abnormal conditions whose presence, even when insufficient of itself, might yet be a potent factor in the production of a cycle of events resulting in glaucoma.

Nicati's Theory.

Nicati's ideas (23) on the origin of glaucoma arise from his peculiar views concerning the structure and functions of the choroid. He holds that the choriocapillaris is contained in a closed sac, open only to the epithelium of the ciliary processes, and he has proved by experiment, to his own satisfaction, that the choriocapillaris participates, as a whole, in connection with the glandular epithelium extending from the root of the iris to the ora serrata, in the elaboration of the aqueous. He holds besides, that this fluid is removed by the lymphatic clefts and lacunar spaces of the iris, by the perivenous channels ending in the vortex veins, and by the anterior and posterior ciliary veins. Glaucoma can, therefore, arise from retention alone, due to (1) congenital insufficiency in the means of exit; (2) inflammatory engorgement of the iris; (3) progressive atrophy of the iris; (4) mydriatics by reducing the surface for absorption; (5) senile, rheumatic, and gouty changes in the iris. But another agent often comes into play in the shape of capillary varices associated with spasmodic œdema of the iris and choroid, the result being an excessive excretion of fluid within the globe. This may be set up by irritation of the iris, and should be considered as secondary to the first agent. Recent observations only tend to confirm the view advanced years ago, that the aqueous is secreted in the ciliary region, and Treacher Collins (24) has, by bleaching, exposed a series of glands hidden in the normal state by their own pigment, subject to catarrh, to cystic overgrowths, and to adenomatous tumour formation, and whose function he claims to be the secretion of this fluid. This theory has been accepted by many surgeons, while others have been unable to agree with Collins. John Griffith (25), for example, considering them too few in number for this important purpose, and to be more probably employed in controlling the amount of pigment in the eye, and in regenerating it as nature demands.

Greef (26) agreed with Nicati that the aqueous, non-coagulable when first drawn, resembles blood serum in its behavior after a second paracentesis, and the changes found in the ciliary processes in the eyes of rabbits removed at various intervals afterward sustained the idea that these originate the aqueous. John Griffith confirmed Greef's observations on the epithelium of the ciliary ridges, and like him found aqueous drops beneath it in newly excised eyes—"an exaggerated form of the normal secretory process." But, while most are agreed concerning the action of the ciliary processes, no confirmation appears to have been afforded of Nicati's observations on the chorio-capillaris, and Griffith denies all ground for the statement that the chorio-capillaris lies in a closed impermeable sac, and maintains that Nicati's assertion of a similiarity between its vascular arrangement and that of the ciliary processes is quite erroneous. He does not accept the ideas of either Collins or Nicati, but holds to the old one of the ciliary excretion propounded by Young and again by Vetch (27) in 1820. Inflammation and œdema of the choroid have been discussed in connection with von Graefe's and Stellwag's theories. An inflammation of the chorio-capillaris was also supposed by Sattler (28) to have a relationship to glaucoma, but he has himself shown that it is absent in recent cases of simple glaucoma, while Klebs has found it to be only a secondary complication (Schnabel 29). We have already seen that the iris may be normal in glaucoma, and we know that it may be practically entirely absent without glaucoma, while the actions of operative measures and of miotics are difficult to reconcile with Nicati's theory of its causation.

Glaucoma Originating at the Optic Nerve.

This section should be read in connection with those dealing with papillitis and cupping of the disc, in which it is stated that certain authors believe that a morbid process is always present before the appearance of increased tension; while others, without going so far, consider that such a process is one of the earliest symptoms of glaucoma. It will be well to consider now whether sufficient evidence has been produced to justify a belief in disease in the region of the optic nerve as a proper cause of glaucoma, in the sense in which certain affections of the anterior part of the eye are so considered. Brailey (30), in 1877, said that no connection is shown, in his observations, between the optic disc, considered as a means of escape for the fluids of the eye, and increased tension; and again, that the optic nerve and its sheaths are not productive of glaucoma. In 1880 he (31) found "in most cases such a condition of the optic nerve as would hinder the passage of fluids along it, though this has not been proved by experiment to be a channel of exit, * * * and sometimes indications of an accumulation in the intergranule layer near the optic disc, and more often in the neighborhood of the ora serrata, besides * * * an accumulation in front of the lamina cribrosa and * * * sometimes * * a fissure or layer of loose tissue leading to this from the intergranule layer * * * consistent with the existence of a current from the outer retinal layers to the lymph channels of the optic nerve." Yet he added that "sclerosis of the optic nerve and lamina cribrosa when unaided has no effect on tension, for it exists with normal tension in many cases of central disease." In 1881 he (32) noted that inflammation of the uvea, along with optic neuritis with slight haze and swelling of the papilla, is present at the commencement of primary glaucoma; and the same year, while asserting (33) that inflammation of the ciliary body, iris and optic nerve, is always present before increased tension, and that after recession of the ciliary muscle and dilatation of the circulus arteriosus major have occurred, a dense connective tissue forms between the fibres of the ciliary muscle and in the optic nerve, he still laid the blame for the glaucoma upon the anterior part of the eye.

Mauthner's theory (34) included a morbid process in the optic nerve, but did not suggest that glaucoma is caused by interference with filtration from the eye at that point; rather that the excavation is dependent upon a condition of the optic nerve which is not always present, and which, when it arises, is a result of choroiditis.

De Wecker (35) said in 1879, "that the idea *of an anterior and a posterior glaucoma*, which the younger Desmarres put forth some ten years ago, when he attributed the affection to inflammatory disturbance attacking two different circulatory systems, should perhaps, as Stilling proposes, be resuscitated for the channels of elimination." But one would require to know "how the vitreous humor * * * rids itself by filtration (through its central canal) of the products of elimination." De Wecker stated that he had always taught that the pericorneal region and that of the optic nerve are the only ones where the interior of the eye is without a hyaline amorphous membrane, quite unfit for filtration.

Schoeler (36), after experimenting on rabbits by tying the optic nerve and its sheath (he did not say whether in front of or behind the cenrtal artery), and injecting chloride of sodium in solution, concluded that "if the posterior lymph spaces (after Schwalbe) lie around the optic nerve and communicate with those in the retina and choroid, they are yet of no importance for removing fluid from the eye," and (37) "the assertion of certain authors that a glaucoma posticum can develop through hindrance in filtration from these spaces" is unnecessary as well as directly negatived by these experiments; also (38), in long continued and marked increase of tension caused by the injection of the solution into the vitreous it has never happened that a flow could be discovered from the divided end of the optic nerve.

Stilling, who had drawn attention to the optic lymph path at the Ophthalmological Congress in 1877, again at the Heidelberg meeting in 1885, divided glaucoma into anterior and posterior, and stated that the optic nerve possesses an exit for the vitreous fluid. In nearly all glaucomatious eyes, especially in absolute and least in fulminating cases, he found dilatation of the dural sheath which he believed to be compensatory. By experiment he proved young eyes to fllter better than old, and those which were glaucomatous with the greatest difficulty. He concluded that glaucoma is a hypersecretion of normal fluid whose exit is hindered on account of senile discharges.

Ulrich (39) stated that only where the anterior part of the eye is inflamed does the optic nerve pass much fluid. Nettleship (40), in 1888, whilst noting the importance of any evidence pointing to the existence of a posterior glaucoma, and quoting cases of his own in which he considered that such might be its beginning, said that "the atrophic thinning, with little or no shrinking, of patches of the iris which is sometimes seen quite early in the disease." is one of the many evidences in favor of the belief that glaucoma, of all varieties of acuteness, usually starts in the ciliary region rather than in the optic nerve. Haensell (41), in 1890, considered that a hyaline degeneration of the optic nerve spreading to the vitreous is preliminary to the production of increased tension. Knies (42), in 1890. believed that in the beginning of glaucoma, and visible in all eyes before cupping has taken place, an infiltration of the optic nerve may be found, along with a similar condition in the corneo-sclera border, and the neighborhood of Schlemm's canal. Bitzos (43), in 1894, wrote that "one can accept as an absolutely certain fact that the glaucoma has begun by a papillitis," * * * and that a blocking of the lymph channel in the optic nerve accounts for all symptoms. But as ordinary optic neuritis does not render the lamina cribrosa more feeble, or produce increase of tension, we must suppose something peculiar about glaucomatous optic neuritis. The papillary lesion. constant in primary glaucoma, suffices to explain, by the hypertrophy of the connective tissue of the optic nerve and lamina cribrosa, which it causes, the obliteration of the optic path, if such exist. Galezowski (44), in 1894, believed that in simple glaucoma a spontaneous obliteration takes place in the lymphatics toward the back of the eye, and in the neighborhood of the optic nerve, whence arise the retraction of the lamina cribrosa, the hindrance to the lymphatic circulation in the papilla and the consecutive atrophy.

Knies (45) found signs of inflammation in the region of the sinus of the anterior chamber and optic nerve after introducing strongly irritating fluids into the vitreous, a condition which he had previously designated "glaucoma imminens," and, though the tension never rose and true glaucoma never appeared, he yet apparently here found confirmation of what he had already said of the common affection of the optic nerve in the stages of glaucoma before *plus* tension.

In connection with the above evidence it is not clear that interruption of a supposed optic nerve path would permanently close the anterior exits, and without that it is hard to understand how the tension could be permanently raised. Besides, it has not been settled that the optic nerve affords a passage for fluids of any great importance.

If it be true that optic neuritis is common at the commencement of glaucoma, it appears to be more likely that it occurs either as a complication of the true cause, or to be secondary to it, rather than that the neutritis itself originates the high tension.

Heredity and Constitutional States.

Gout has long had an evil reputation as a cause, or *the* cause of glaucoma, and even now, when a better knowledge of ocular pathology exists, gout is sometimes ranked among the obscure conditions of health which initiate the glaucomatous cycle. Beer is said to have pointed out the arthritic nature of glaucoma early in the present century. Sichel (46), in 1842, advised the use of anti-gout treatment for glaucoma, and in 1854 MacKenzie (47) said that the Germans considered glaucoma to be almost always due to gout, or gouty disease of the choroid. Hutchinson and Everbusch (48) thought that gout might be an important etiological factor in glaucoma, while Richey (49) is very strongly in favor of this view, and can find an explanation for every symptom on the hypothesis of a hyperplasia and subsequent contraction of the connective tissues of the eye.

Walters (50) and others have reported cases benefited by anti-gout treatment, and Rabinowitsch has noticed asthenopia for near work disappear under the same treatment.

The above is sufficient to show how pertinaciously this idea has been held, and, perhaps, also how hypothetical its grounds. Modern criticism is not content without some fuller explanation of its *modus operandi*. and the effect of treatment based upon the theory, as well as its impotence in explaining many forms of the disease, do not justify the surgeon in laying great stress upon it as generally applicable.

Syphilis. I am unaware that any distinct proof has been produced that syphilis causes glaucoma, but there is an impression in the minds of some ophthalmic surgeons of the first rank that it is more common among those who have had, than among those who have not had, syphilis; and it seems very reasonable, when one considers the variety of the pathological products of this disease, and the frequency with which it attacks the uvea, that the initial process may be set up by it. Galezowski (51), for instance, has recorded two cases, one in a lady of 43 and the other in a child, in which iridectomy and mercurial inunction had a satisfactory effect, the probable syphilitic causation being the point to which he apparently wished to draw attention.

Rheumatism. also, but on what scientific grounds I am unaware, takes high rank with some ophthalmologists in this connection; so much so that they prescribe salicylate of soda as routine treatment in all cases of glaucoma.

The onset of glaucoma may be decided by exposure to cold (Nettleship 52), and besidas rheumatism, gout, syphilis, anæmia, and many *other constitutional diseases*, by "injuries of various kinds; cardiac, vascular and nervous disorders, neoplasms, congenital malformations, and senile changes. The primary, no less than the secondary, forms of the disease spring from various and complex causes, including many of those just mentioned. Primary glaucoma seems to depend sometimes chiefly on systemic, vascular or nerve disturbances, sometimes on individual peculiarity in the build of the eye, and often on a complex co-operation of several causes." (Priestley Smith 53.)

*Heredity** has long been acknowledged as an influence in the production of glaucoma, and that at an age earlier than usual, some local predisposition being generally blamed, the result of one or other of the diseases above mentioned, some other vascular or nervous affection, rigidity of the sclera, or the disproportionate size of the lens in a small globe. The last has the advantage of having been actually demonstrated, but it is not claimed by its author, Priestley Smith, that no other condition may be operative.

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*NOTE.—The following are some of the published cases of appa-

Races.—It has been frequently asserted that Jewish eyes are more liable than others to glaucoma, for instance, by Benedict of Breslau, in 1825, one-half of whose cases were Jews; by Knapp (60), and by Fuchs (61); but when considered in proportion to the whole population, writers have by no means unanimously adopted this opinion (62). The Egyptians, according to Brugsch Bey, and the negroes of Brazil, according to Moura (63), are especially liable to the disease.

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rently hereditary glaucoma: Von Graefe reported (54) families in which glaucoma appeared successively in several generations; Schmidt-Rimpler(55), a mother and two daughters, a father and two sons, a father and three sons, a mother and two sons; Mules (56), a father and two sons; Nettleship (57), who said that simple glaucoma is sometimes hereditary, and advised that "observations should be made on the discs of children of glaucomatous parents," reported a man with chronic glaucoma, whose daughter suffered from rainbows for some time, and whose son had large physiological cups, while a first cousin lost an eye from chronic glaucoma: Harlan (58), cases occurring for several generations in certain families; Somya (59), a father and three children, all myopic; and Arlt, Stellwag, Pagenstecher, Benedict, Mooren, etc., have recorded cases.

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CHAPTER VIII.

ETIOLOGY—(Continued).

Refraction and Glaucoma.

There is no doubt that the idea that hypermetropia predisposes to glaucoma has been fairly general in the profession, and with reason, for that has been frequently asserted by excellent authorities. For instance, Fuchs (1) says: "A disposition to inflammatory glaucoma appears to be present before all in the hypermetropic eye, whereas markedly short-sighted eyes are said to be little prone to the disease," which has been explained (2) as due to the fact that myopic eyes have deeper anterior chambers than emmetropic, and still deeper than hypermetropic eyes, while they have smaller ciliary muscles than either, and especially than hypermetropic, in which the association of a shallow anterior chamber and a large ciliary muscle, liable when swollen to press the iris against the cornea, is perilous to the health of the eye in certain circumstances. Stedman Bull (3) found in his cases of chronic glaucoma that hypermetropia was ten times more common than myopia. On the other hand, we must remember that hypermetropia is probably the commonest refractive state in most countries, and especially so in advanced age, as well as in childhood. Priestley Smith (4), whose cases, however, were not all chronic as Bull's were, found in 164 eyes hypermetropia in 45.1 per cent., emmetropia in 40.9 per cent., and myopia in 14.0 per cent.; and Kryonkoff (5) found hypermetropia in about the same proportion in cases of primary glaucoma, 43.18 per cent., emmetropia in 28 per cent. and myopia in 28.78 per cent.; while in more than 10,000 consecutive ophthalmic cases tested in regard to refraction he found nearly the same figures, hypermetropia 43.09 per cent., emmetropia 27.58 per cent., and myopia 29.32 per cent. This, though not absolutely conclusive, is strongly presumptive that glaucoma is not more frequent proportionately in hypermetropia than in other states of refraction. Nettleship (6), who like Bull, was considering chronic cases alone, found that in half his cases associated with myopia the glaucoma began very early; in 18 cases only four had reached the age of 60; hence he concludes that myopia predisposes to glaucoma; or that both are due to one cause. Bull was not able to confirm Nettleship, for in 9 myopic cases occurring in his 90 cases, there were only two under 60 years of age.

Progressive Myopia and Glaucoma.

When high myopia is associated with glaucoma "the tension is rarely very high, though above normal, the field of vision becomes restricted in a manner more or less characteristic of glaucoma; and the papilla is excavated. It is the excavation of the papilla, as well as sometimes the unusual amount of pain complained of, which should lead one to suspect this complication. The excavation is never so deep as in other forms of glaucoma, but it is unmistakable whenever it is seen to reach out to the margin of the papilla. In these cases there is very often a very marked and excessive degree of choroidal atrophy surrounding the papilla, and it is generally supposed to be owing to the comparative want of resistance of the surrounding parts that the yielding of the lamina cribrosa does not assert itself to the same extent as would otherwise be the case" (Berry 7). Fuchs (8) said that "choroiditis and high myopia frequently give rise to increased tension under the picture of simple glaucoma." Noyes (9) remarked that in "myopia glaucoma is hard to diagnose." One idea, illustrated from the above quotation from Fuchs, is that the myopia causes the glaucoma, which is supported by Berry (10), who wrote, "glaucoma in a highly myopic eye is, properly speaking, secondary inasmuch as the choroidal changes which lead to the elongation of the globe probably interfere at the same time with the circulation in that membrane and lead to a glaucomatous complication;" and Knies (11) remarked that passing high tension is found in progressive myopia. Somya (12) related four cases in one family where the father aged 63 and three children aged respectively 26, 15, and 13 years, all suffered from high myopia and glaucoma, but he knows "no reason why scleractesia posterior should lead to glaucoma," and it appeared to him "more probable that the myopia on one side, and the glaucoma on the other, had been inherited, without the one originating or aiding the development of the other." Again in 1881, Brailey (13) wrote that in children owing to the comparative elasticity of the globe "the increasing contents of the vitreous chamber do not require to press so much upon the lens, which in its turn has greater power of resistance owing to the greater tension of the zonule. Thus, the dangers attendant on the contact of iris and cornea are frequently averted. Such cases often present themselves, in my opinion, as cases of progressive myopia." Nettleship (14), who considered the combination of myopia and glaucoma to necessitate a bad prognosis, expressed his belief in 1888, as already stated, that either myopia predisposes to glaucoma or that both are due to the same local cause.

Of these three ideas it is hard to say which is the correct one, or whether each has not its measure of truth. But it seems easy to understand how in eyes only slightly predisposed to posterior staphyloma—on account of local weakness in the sclera, dragging from shortness of the optic nerve, or otherwise, an increased intra-ocular tension might be sufficient to turn the scale and initiate myopic bulging. The following case (15), a *multum in parvo*, is interesting in this connection. Rose S. aet. 18, *R. E.* T. + 1. M. 12 D. Cornea — 9 m.m. in diameter. Iris absent, except a narrow crescentic piece on the inner side for $\frac{2}{5}$ of a circle. Lens in situ and with a diameter equal to that of the cornea O. D. cupped. Myopic crescent on outer side. Opaque nerve fibres. *L. E.* T. + 2. M. and cornea as in *R. E.* No iris except three small isolated bits on the inner side. O. D. cupped. Here we have eyes strongly predisposed, according to Priestley Smith's investigations, to primary glaucoma—very small corneæ, lenses disproportionately large for the diameter of the eyes in the region of the ciliary bodies; probably, at least at one time, small in all directions, and possibly even hypermetropic.

The theory of myopic choroiditis spreading forward does not seem to commend itself as in accord with clinical experience, while those who uphold a "posterior glaucoma" might find satisfaction in explaining the high tension as secondary to an interference with the health of the eye in the region of the optic nerve.

Effects of Accommodation.

MacKenzie (16) considered overuse of the accommodation to be a cause of the "choroiditis of glaucoma;" and

Walker (16, a.) thought that a long continued overexertion of the accommodation produces an irritable state "which only wants some provocation (such as atropin) to develop an active inflammation." W. Schoen (17) laid special stress upon two points: He believed (1) that the lamellæ of the suprachoroidea are the tendons of the central fibres of the ciliary muscle and proceed to the sheath of the optic nerve; and (2) that the zonule anatomically falls into an anterior and a posterior division which have different functions in accommodation. Schoen says that the various forms of glaucoma are due to the actions of the different divisions of this muscle, and that normally the sclera is protected from intra-ocular pressure by the above mentioned tendons, which also by dragging on the optic nerve produce the glaucomatous cupping. "In glaucoma simplex all the muscle fibres are active, and the cup is the result of the dragging of the fibres on the optic nerve. In glaucoma acutum the inner and ring fibres are quiescent, while the external meridional still contract and retain their tone. In glaucoma atonicum all the fibres refuse work." Snellen (18) interprets Schoen's ideas as a hypothesis "that after a strain of accommodation the ciliary muscle becomes suddenly relaxed, and that as a result of this the lens is suddenly pressed forward," and certainly there appears to be little ground for regarding it as anything more than a hypothesis, while it is difficult to understand how relaxation of the ciliary muscle should result in propulsion of the lens.

Quite recently (18 a) Schoen has asserted that if only every one who requires glasses would wear them in good time there would be no more glaucoma; of his last 140 cases 48 per cent. were hypermetropic, and not one of them wore a distance glass: 33 per cent. were astigmatic, always uncorrected: 20 per cent. wore no glasses at all, or lenses which were unsuitable. Women shrink from wearing glasses, and therefore, produce twice as many glaucoma patients as men do.

Snellen himself (19) gave a much more satisfactory explanation of the effects of accommodation in the production of glaucoma, when he observed that the diameter of the lens does not in age, as it does in youth, diminish *pari passu* with the increased diameter of the ciliary muscle on its contraction, whereby the perilenticular space remains nearly constant in width; but that, on the contrary, while the muscle continues on accommodation to advance toward the lens, the sclerosed condition of the latter prevents its retreat to a corresponding degree, the two coming possibly into firm contact, while the slackened zonule permits of the advance of the lens. Snellen finds confirmation of this in some of Priestley Smith's investigations.

Priestley Smith (20) remarked that the connection between strain of accommodation and glaucoma can by no means be denied, but that "it must be remembered that the liability to glaucoma is greatest at a time of life when the accommodation is in abeyance. Much book-work is likely to be injurious, apart from the accommodative act, by reason of the stooping and congestion of the head which it often involves." In a case such as that related by Noyes (21) of an ophthalmic surgeon who, being astigmatic and also glaucomatous, stops the glaucoma by suspending accommodation with atropin and the use of full correction, it is improbable that a primary interference with excretion takes place at the angle of the anterior chamber, and most probable that it originates in connection with the lens and ciliary body in some such way as that described by Snellen and Priestley Smith.

While considering the connection between accommodation and glaucoma it will be interesting to compare the former with the action of the most potent medicinal cure for glaucoma, eserine. During accommodation we have convergence of the optic axis, (which may be left out of consideration here), diminution in the size of the pupil, and contraction of the ciliary muscle; during the action of eserine we find a similiar contraction of the pupil, as well as action of the ciliary muscle productive of myopia. As eserine benefits glaucoma, why should not accommodation? The difference between their actions is probably chiefly one of degree, the eserine contracting the pupil very markedly, the reason generally given for its salutory effects, and possibly also producing a state of greater hyperæmia of the iris, which perhaps should not be altogether ignored when taken in conjunction with its probable effects upon a previously congested ciliary body, while the ciliary muscle is thrown into a state of prolonged spasm. It has been said by excellent authority that cases of glaucoma have actually been produced by eserine, and it is not an uncommon experience that both eserine and pilocarpine act not only without benefit, but appear distinctly to accentuate the disease. Are some of these cases in which, from the inelastic condition of the lens or the laxity of the zonule, excessive accommodation might have had a similiar effect?

Glaucoma Caused by Mydriatics.

MacKenzie (22) found it necessary to relinquish the use of atropine in certain cases of glaucoma on account of an increase of symptoms due to it; and (Laqueur 23) in 1877 drew the attention of the profession to the effects of calabar bean and atropine in this disease, and cited experiments made by others on the intra-ocular tension under their influence.

It had long been understood that atropine reduced the tension in corneal and iritic diseases; and Pflueger (24) found in 81 per cent. of all eyes distinct diminution, in 16 per cent. no change, and in 3 per cent. increase of tension on account of its local application. Adamuek (25) confirmed the observations of Wegner, Gruenhagen, and Coccius on animals, that it lessened the tension. Wharton Jones (26) said atropine was dangerous in acute glaucoma, and v. Graefe (27) had noticed a "latent chronic glaucoma" changed into an acute attack by atropine. Laqueur believed that though it is a means of increasing tension "this action does not appear so long as the circulatory apparatus is in good working order." G. E. Walker (28) considered it a typical provocative of glaucoma, "since it excites the radial fibres to drag on the congested and irritated circular muscle." Story (29) related a case of glaucoma in one eye and a month later in the other, appearing suddenly in each case two hours after the subconjunctival injection of cocain for operations on the external muscles. Walter (30) published two cases of glaucoma produced by scopolamine, which was on its first introduction considered by some surgeons, without very obvious reason, as a safe mydriatic as regards glaucoma; and other cases have been reported.

The above is sufficiently illustrative, and it may with safety be said that without exception all mydriatics are to be avoided in an eye predisposed to glaucoma, and that their action should be watched in every case, and more especially after middle life.

The most generally accepted explanation of this, and that which has the firmest scientific basis, lies in the fact that mydriatics crowd the iris into the filtration angle, and tend to block it. Still it is as well to bear in mind their paralyzing effect on the ciliary muscle, as well as the possible hyperæmia of the ciliary body produced by the emptying of the vessels of the iris on its dilatation, mentioned by Fuchs (31) as the probable reason for the ill effects of atropine in some cases of irido-cyclitis. Knies (32), to support his theory that glaucoma is due to an irritation of the anterior exits for the intra-ocular fluid caused by a glaucomatous poison circulating in the eye, supposed that mydriatics, causing hyperæmia of the fundus, accelerate tissue metamorphosis, "so that the nocuous elements contained in the latter are hurried along faster and in greater quantity toward the channels of outflow of the eye."

Glaucoma Caused by Operation.

It has long been acknowledged that an attack of glaucoma in the previously sound eye may be precipitated by an operation on the other, so much so that it has become a very general proceeding to instil eserine into it beforehand, as was at first recommended by Arlt. The frequent depression of mind and body produced by the circumstances has been very greatly credited as the cause, and Fuchs (33) found in this two probable factors, the interference with the circulation, and the resulting reflex dilatation of the pupil. Swanzy (34) thought that the dilatation of the pupil, the immediate cause, is a consequence of confinement in a dark room.

Ocular Hyaline Degeneration and Glaucoma.

A hyaline degeneration of tissues has been proposed as the foundation for the glaucoma process and somewhat elaborated by Haensel. Vossius (35) in 1888 related a case in which hyaline degeneration and sclerosis of arteries in the choroid, and cellular infiltration round the veins, co-existed with obliteration of the angle of the anterior chamber; and Klebs (36) in 1889 found hyaline degeneration in the vessels in a number of cases of blind glaucomatous eyes, and in one recent case. He thought this had a close casual relationship with glaucoma. V. Garnier (37) in 1892 was convinced that there is a diminution of the natural elasticity in the choroidal vessels when spontaneous increase of tension is present. Haensell (38) said that the cellular matter which in fœtal life unites the vitreous lamellæ arranged around the branches of the hyaloid artery, transforming later so as to leave the vitreous like jelly, in glaucoma condenses so that the passages are completely closed to the circulating lymph, an accumulation takes place between the lamellæ which augments the intra-ocular tension, and from lack of proper nourishment the vitreous atrophies. Other parts of the eye show analagous changes, and to this interference with nutrition Haensell ascribed glaucoma, beginning sometimes with softening and excavation of the optic nerve, the increased tension setting in only after the degeneration has spread thence to the vitreous. On the other hand, when the vitreous is first affected tension may arise and continue without cupping, and even with normal visual acuity. Priestley Smith (39) admitted as a possible hypothetical cause of some cases changes in the hyaloid membrane, in the stroma of the vitreous, or in the constitution of the vitreous fluid; while Knies (40) has found the vitreous generally normal except in the late stages to which it and the hyaline degeneration of vessels, when present, belong. In the glaucomatous eyes whose arteries one has most opportunity of examining the vitreous is frequently found to be much shrunken and detached, especially posteriorly.

Sclerosis of Tissues and Glaucoma.

It is generally admitted that the sclera is more rigid in age than it is in youth, but some writers assert that it is specially so in glaucoma, which may result from this inelasticity. Gosetti (41) and Del Monti (42) are quoted by Knies as stating, the former that glaucoma is caused by a general sclerosis of the ocular tissues, and the latter that it may be due to a sclerosis of the anterior part of the sclera and of the cornea. Richey (43) is able to find an explanation for every feature of glaucoma on the hypothesis of a general sclerosis. Arlt (44) believed that special rigidity of the sclera causes stasis, the first stage in glaucoma; and Straub (45) noticed less elastic retraction of the choroid from the sclera on incision than in normal eyes. Schmidt-Rimpler (46) considered rigidity and alteration in the elasticty of the choroid to be important, as did Weber (47), Koenigstein (48), v. Garnier (49), and others; whilst Somya (50) suggested that in hereditary glaucoma the fault might lie in rigidity of the sclera. On the other hand, Hulke, Nettleship, Schnabel (51), and

Brailey (52) have found no special rigidity in glaucoma.

Glaucoma Caused by Changes in the Shape of the Globe.

Roeder (53) thought that a tendency in advanced age for the eye to become cone-shaped inclined to narrow the angle of the anterior chamber, drag on the ciliary processes, and produce an excessive excretion from them. Von Garnier (54) considered that when scleral stretching exists the iris and cornea are brought into apposition, and the angle is closed. It is well known that staphyloma of the cornea and of the ciliary region are not infrequently associated with high tension. They are sometimes caused by the glaucoma, and sometimes the altered relations of the cornea and iris interfere with the excretion of ocular fluid and produce it. In exceptional cases glaucoma may arise in interstitial keratitis, with or without bulging of the cornea, and independent of synechia, or in softening of the cornea associated with pannus. In some of these cases frequent sclerotomies have a most beneficial effect.

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CHAPTER IX.

GLAUCOMA IN THE YOUNG: IN ANIRIDIA AND COLOBOMA OF THE IRIS: AND IN APHAKIA.

Glaucoma in the Young. Glaucoma in young people may be divided into two groups, that constituted by one or other of the forms of "*senile" glaucoma, only occurring at an unusually early age*. and with nothing else specially to separate it from ordinary glaucoma; and that in which an abnormal dilatation of the globe, and especially of the cornea, results from the excess of pent-up fluid in the interior of an undeveloped and distensible eye, a disease to which the names *buphthalmia*, *hydrophthalmia* and *cornea globosa**, have been given. The essential difference between buphthalmia and ordinary glaucoma lies, therefore, not in the causation of the increased tension, but in the less power of the globe to retain its natural dimensions under pressure, care being taken to distinguish the equable dilatation of the whole eye from a mere staphyloma.

I. **Buphthalmia.**—*Symptoms.* Superfluous intra-ocular pressure, whether as a result of some invisible cause and, therefore, called primary, or secondary to, for instance, a leucoma adherens, not being met by such a resisting capsule as in an older eye, is able to distend the globe by dilatation and thinning of its walls to a diameter of even 38 m.m. from before backward, and 28 m.m. across. In a case of Warlomont's the cornea was 17 m.m. in diameter. The effect of this is to let the dark uvea shine through the sclera, to enlarge and sometimes flatten the cornea, which may be clear or opaque; and, as the lens does not participate in the abnormal enlargement, the zonule, on account of the separation of the elongated ciliary body from the lens, is stretched, maybe ruptured, with luxation of the lens which, in any case, is flattened, sometimes opaque, and changed into a spongy network with thickened capsule, or occasionally is absorbed. This lack of support behind produces irido-donesis, the anterior chamber is deepened, while myopia necessarily accompanies the antero-posterior elongation of the globe to an extent which must be modified by the state of the lens. The ciliary body and choroid may atrophy. The disc is frequently cupped in spite of the general yielding of the walls, which may, however, render less apparent the tendency to increase of tension. The retina is sometimes detached. secondarily to the detachment of the hyaloid from the retina, owing to the fact that the vitreous may not expand to the same extent as the globe.

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*NOTE.—Schweigger (1) asserts that "cornea globosa" should be applied only to cases of abnormally large cornea with deep anterior chamber, and without stretching or thinning of the sclera. but does not explain the origin of such cases, and the above terms are used indiscriminately by others (*e. g.*, Fuchs and Swanzy).

The enlargement of the globe may cause an increase in the size of the orbital cavity. The vision is poor, the field contracted, and photopsia and nystagmus are sometimes found. These symptoms, though they may remain stationary, or even diminish, are apt to progress toward greater destruction of the ocular functions.

Etiology. Cases of buphthalmia may be divided into those which are secondary to some visible pre-existing cause, and have their counterpart in the secondary glaucoma of adults, and those which are congenital.

(a) **Secondary Buphthalmia** is by far the commoner, and cases have been published within recent times by—among others—Brailey (2), two cases with posterior synechia and small immovable pupil, T +, and optic disc cupped; and five cases (3) in which the iris was partly, or quite, adherent to the cornea; and by Treacher Collins (4), five cases, four due to adhesion of the iris to a perforated cornea. and the fifth to intra-ocular tumor. The average antero-posterior diameter of those globes, the measurements of which are given, is nearly 30 m.m., the vertical about 25 m.m., while the corneal was about 14 m.m. A globe has been examined which measured 38 m.m. from before backward, and 28 m.m. across (Schiess 5). In each of Collins, cases the disc was cupped.

(b) **Congenital Cases.** Cross, of Bristol, has reported a case in which the antero-posterior diameter of the globe reached 40 m.m., and another which measured 28 m.m. across, and whose cornea was 19 m.m. in diameter.

Various theories have been advanced to account for these cases, which are usually binocular, and which have been found in the pig and horse, as well as in man: as, for instance, that they are due to an arrest of development of the cornea before differentiation takes place between it and the sclera (Steffan 6, Mueller 7). Duerr and Schlegtenda suggest that the oblique muscles by pressure indent the sclera and interfere with the circulation through the vortex veins (8). They describe five cases, the important points in Case I, a girl aged 18, being the presence of round-celled infiltration at the cornea-scleral junction, with many vessels, some entering the cornea; and that Schlemm's canal was lost to view except in a few sections, where it was just visible, while the angle was open. The disc was cupped. Case II—No history; had a similar, though less marked, condition of the corneo-scleral junction. The angle was occluded in places, lens shrunken and calcareous, Schlemm's canal obliterated in places by round, spindle and pigment cells: optic disc cupped, vortex veins normal. Case III—Boy, aged 12, eyes affected since infancy, cornea infiltrated and vascular, two vortex veins had both trunks and branches pigmented externally, and one was contracted in caliber; optic disc cupped. Case IV—Boy, aged 19, eyes gradually enlarged from infancy; left eye had a cornea measuring 16.5 m.m. vertically, and the globe was 35 m.m. from before back and 27 m.m. across. Cornea was vascular, angle open, no canal of Schlemm, and spaces of Fontana partially filled by cell infiltration; optic nerve degenerated; the vortex veins were dilated under slight staphyloma of the sclera. Case V., the right eye of Case IV. In the line of the superior oblique was a deep groove; there was no trace of Schlemm's canal or of the spaces of Fontana. The vortex veins did not indicate retarded circulation so plainly as in Case IV., though that was sufficiently evident.

On reading these cases one can hardly help concluding that there is too little foundation for the belief that any one of them was produced by muscular action, for, except perhaps in Case III., there is ample reason in the condition of the corneo-scleral junction and the angle for the production of increased tension, and it is only to be expected that in an enlarging and soft globe contracting muscles encircling it should leave their mark as a constriction.

Other authors (Horner and Meiralt in Zurich, 1869, Gallenga, Raab (9), Mauthner (10), Pflueger (11), Dufour (12), consider buphthalmia to be due to pathological causes, such as intra-uterine irido-choroiditis, or to congenital weakness in the zonule of Zinn and corneo-scleral ring; while Panas (13) adds that the type is that of consecutive glaucoma, due to the frequent occlusion of the iritic angle by excess of secretion.

Buphthalmia is sometimes hereditary, as in Randolph's case (14), where a brother and sister were affected; the first of Duerr and Schlegtenda's cases, above quoted, where the parents were cousins, and two of the patient's brothers, aged respectively 20 and 8 years, suffered in the same way; and one case noted by Treacher Collins(15) whose sister suffered like herself from hydrophthalmia. Warlomont (16) published a case in a patient aged 13 with a cornea measuring 17 m.m. across, and with a vision of $\frac{2}{3}$. Treacher Collins (17) described five eyes excised for primary buphthalmia, and asserted his belief that congenital cases are probable "due to some defect of development in the filtration area at the angle of the anterior chamber. In some cases it appears that the canal of Schlemm (Case II.) is absent; in others, that the iris does not become separated from the back of the cornea up to its extreme periphery, and that a congenital adhesion in this position prevents the exit of the fluid from the eyes." Later, Collins brought forward a new theory (18), founded upon developmental physiology, which has received the support of Priestley Smith, Cross of Bristol and others, and which certainly appears to be well founded. Collins referred to the facts that before the appearance of the iris in the fœtal eye that portion of the epiblast which goes to form the lens is cut off from the cuticular epiblast by the ingrowth of the mesoblast, which is divided into two layers, the posterior forming the anterior fibro-vascular sheath, and the anterior forming the substantia propria of the cornea and Descemet's membrane. At this time there is no anterior chamber, and the lens is separated from the cornea by the anterior fibro-vascular sheath alone, which is in contact with both. As the iris grows out from the ciliary body, carrying in front of it the prolongation of the posterior fibro-vascular sheath, which goes to join the anterior, it insinuates itself beneath the anterior sheath and raises it up from the surface of the lens. The sheath ultimately becomes united to the iris, whose anterior layer it forms, while that portion filling the pupil beyond the limit of extension of the iris takes the name of "pupillary membrane," which ought to disappear, but occasionally remains in part persistent, and may be seen proceeding from the corona of the iris to the lens capsule, and even to the back of the cornea. When the aqueous begins to be secreted and the lens to be flattened the cornea and iris separate, unless from failure of the normal complete absorption of the bands between them. It is to the pressure of such corneo-iritic adhesions or anterior synechia that Treacher Collins ascribes at least some cases of congenital hydrophthalmia. In cases recorded by Beck (19), Samelsohn (20), Makroki (21), and Zinn (22), there existed some doubt whether intra-uterine corneal perforation might not have caused the synechia, but Collins described a case in which the cornea is without a sign of such perforation, but a fibro-cellular membrane remained behind the lens, and a large piece of a persistent pupillary membrane, as well as the pupillary border, attached the iris to the cornea. Collins has seen other cases of the kind, one adhesion passed between the iris and the ligamentum pectinatum. In the next the adhesions were situated rather nearer the periphery of the iris than its pupillary border in its outer half, were 12 in number, and appeared as little whitish elevations of the iris tissue coming forward to the back of the cornea, which latter was perfectly clear. This eye also contained some slit-like openings through the substance of the iris just external to its sphincter muscle. In another the iris was adherent at its upper part to a clear cornea, and at the periphery closely attached to the cornea on both sides of the section. Posterior synechia also existed, but no round-celled infiltration in any part of the uvea. The anterior fibro-vascular sheath in this case appears to have been unable to separate from the cornea, both in this region and at the periphery. In another case Collins found extensive peripheral adhesion of the root of the iris to the cornea, and in several other eyes affected with congenital glaucoma, and in which iridectomy had been unsuccessfully performed, he found with the microscope in each one that the angle of the anterior chamber was closed in the region of the coloboma, as well as elsewhere.

In the transactions of the British Ophthalmological Society, 1895-6, Cross of Bristol has detailed an examination of three eyes excised for congenital buphthalmia. They all had deep anterior chambers; the first showed definite adhesion of the root of the iris to the ligamentum pectinatum: the second, no definite adhesion, but strands of tissue suggestive of a former contact of iris and cornea, which had given way; and the third, a distinct block of considerable width, occluding the angle. Cross concludes that his "specimens are in strong support of the view that the essential cause of congenital hydrophthalmos lies in the imperfect condition of the filtration angle." Devereux Marshall at the same time showed a hydrophthalmic eye in which the anterior chamber was very deep, and yet its angle was distinctly closed.

How is it that such cases ever improve with advancing age? An explanation may lie in the condition found in an eye examined by Collins, which had to be removed on account of a blow. In it fine adhesions uniting iris and ligamentum pectinatum appeared to have been stretched until the angle had become widely open.

II. The second group is that which includes cases of **ordinary primary glaucoma without dilatation of the globe, but occurring at an unusually early age.** These cannot properly be separated from "senile" glaucoma, and are introduced here chiefly to distinguish them from buphthalmia, and to illustrate the ages at which increased intra-ocular tension may exist without causing enlargement of the eye. For instance, in recent years Nettleship (23) mentions 15 cases beginning before the age of 30 years. In nearly two-thirds the eyes were myopic: 11 of these were between 20 and 30, and the remaining four were under 20 years of age. Both eyes were affected in seven of the cases, and of the four cases below 20 years old both eyes were affected in only one. Iridectomy was beneficial, even though two of the cases operated on had considerable myopia. "It is worth noting that in one case of double glaucoma at about 20, with very high myopia, the patient, a male, was almost a dwarf and obviously cretinous, and that in three others, all girls, the patients were stunted, feeble and backward." Spencer Watson (24) published the history of a case in a woman, aged 23, and Brailey (25) a case of a girl aged 18, with in the right eye myopia of 12 D., opaque nerve fibers, and a cornea of 9 m.m. in diameter. T+1. The left eye was also myopic; cornea measured 9 m.m. T + 2. The optic nerve was cupped, and the iris was nearly entirely absent in both eyes. Priestley Smith (26) found that among 1,000 cases of primary glaucoma the average number beginning under the 20th year is less than 1 per cent., and that the increase with advancing age is slow for a considerable time longer, the average being a little higher in the decade between 20 and 30. I have already quoted an interesting case (see Glaucoma Produced by Mydriatics), published by Story (27) of a girl aged 13 in whom acute glaucoma appeared in the right eye after the use of atropine and cocain, and an operation on an external ocular muscle of that eye, and a month later in the left eye after cocain and a similar operation upon it. In the same paper Story relates the case of a girl of 18, with a cornea of a diameter of 12.5 m.m., deep cups and T + 2, and quotes the following from Schmidt-Rimpler in the Graefe-Saemisch *Handbuch:* Glaucoma in a girl aged 9 (Stellwag), a boy of 12 (Schirmer), a boy of 16 (Mooren), a boy of 19 (Mooren), a woman of 20 (Peffmueller), and a

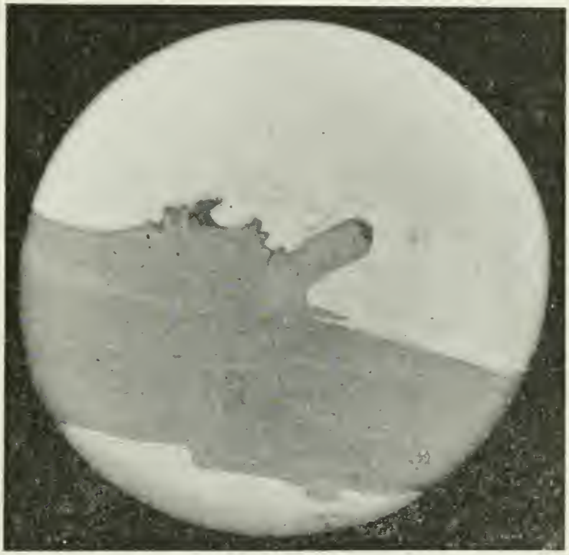

Fig. 7. Glaucoma in an Eye with Apparent Congenital Aniridia. A congenital adhesion unites the root of the Iris to the Cornea, due to an insufficient development of the normal separation of the Iris and Cornea. There was also anterior polar cataract. This patient's mother, who had the same condition of the Iris, acquired Glaucoma secondarily to a corneal ulcer.

"patient" of 22 (Schirmer). Many other cases have been observed in young people, and the above are given merely as examples.

In Aniridia and Coloboma of the Iris.

That glaucoma could occur in an eye in which no iris is visible by external inspection seemed to clearly prove that any theory in which it took a principal part must be erroneous; and such cases have been recorded by Windsor (28) of Manchester, H. Pagenstecher (29), Armaignac (30), Brailey (31), Lang (32), De Schweinitz (33), Rindfleisch (34), etc., while Treacher Collins (35), besides describing three cases. discussed the etiology of both the glaucoma and the conditions to which it is due. It is the rule to find that where there is apparently none there is really an undeveloped iris hiding behind the corneoscleral junction, its meager extent being probably due, as suggested by Manz, to a pathologically prolonged continuance of the fœtal contact of the lens and iris, preventing the ingrowth of the latter. But the narrow iris is theoretically of sufficient width to block the filtration angle, and practically this is found to have taken place in some cases at least by means of congenital bands passing between iris and ligamentum pectinatum. The argument of these cases against the angular retention theory is, therefore, found to be invalid. (See Congenital Buphthalmia.) In traumatic aniridia glaucoma may supervene on adhesion to the corneal wound of the lens capsule, ciliary processes, or vitreous.

Glaucoma in Aphakia.

Considerable importance has been attached to the fact that glaucoma may appear in the aphakic eye, because this has been assumed by a number of writers as sufficient evidence of the error of such views as ascribe an important place to the lens in the etiology of increased tension. That such assumption was premature, and lacking in sound foundation, will immediately appear. Bowman (36) in 1867, and v. Graefe (37) in 1869, had observed glaucoma not uncommonly after extraction, the former noting a special liability to it after needle operations, and not due to iritis, while the latter blamed an irritation of the iris or ciliary processes set up by lens cortex or capsule.

Brailey (38), even while asserting that the apposition of iris and cornea is due to mechanical pressure from behind the level of the lens, observed that the latter is not necessary for the production of glaucoma. Priestley Smith (40) reported a case due, he thought, to the formation of an impervious membrane between the vitreous and aqueous chambers by the adhesion of an inflamed and thickened iris to the lens capsule, with secondary closure of the angle of the anterior chamber from pressure from behind. Stoelting (41) published a case of a woman aged 64, in whom glaucoma supervened on extraction after 14 days. The eye had to be removed three and a half months later in spite of two sclerotomies, one iridectomy and one tearing of the capsule. The capsule and the iris were found to be incarcerated in the wound, and the angle was closed all round by adhesions between iris and cornea. Stoelting ascribed the *plus* tension to traumatic choroiditis producing an increase of fluid in the vitreous which closed the angle. Treacher Collins (42) described four cases of high tension after extraction, ending in blindness and not caused by iritis, In two of these cases he found adhesion of the lens capsule and of the iris to the corneal cicatrix, and he explained the glaucoma as being the result of a forward traction on the iris, bringing it into contact with the cornea so as to block the filtration angle. Mittermaier (43) reviewed sixteen already published cases, and added to them five new ones from Prof. Becker's clinic. The glaucoma sometimes was, and sometimes was not, preceded by inflammatory symptoms. Natanson (44) collected 28 cases, and added 9 others from his own observation or from the register in St. Petersburg. He divided them into two groups: (I) Twenty-six cases. In these glaucoma appeared during the first few weeks or months of after-treatment, some having been discharged in a satisfactory condition. Entanglement of the iris or capsule was always found. (II) Eight cases. In these the glaucoma appeared several years after the extraction. Natanson quotes Becker as having examined with the microscope 38 eyes from which the lenses had been removed. In only one-third of these was the iris free from adhesions to the scar, although 32 of the eyes were removed *post-mortem*, and with no history of trouble, and Becker considered that minute adhesions may be quite undiscoverable in the living eye, and suggested the probability that such complications may originate the glaucoma even in eyes which appear to be free from them, while he also believed that glaucoma might be primary in aphakial eyes. Natanson concluded that when the lens has been removed glaucoma is usually secondary to hæmorrhage, iritis, prolapse or adhesion of the iris or capsule in the wound, or swelling of the remnants of the lens cortex, and is usually inflammatory. It may follow any method of extraction, but probably a good iridectomy lessens the probability of glaucoma, as well as its severity, which is an argument in favor of the combined method. Knies (45) thinks that the reason for the appearance of these cases is that the iris has been insufficiently removed at the time of the extraction. Treacher Collins (46) reported 10 more cases, and in them the prominent feature was an adhesion between the capsule and the corneal cicatrix. Schweigger (47) said "glaucoma in aphakia also witnesses against the retention theory." Priestley Smith (48) reported two cases occurring in children after the lens had been absorbed after needle operations. In one a peripheral posterior synechia united the iris to the capsule or hyaloid; in the other the pupillary margin was adherent throughout to the remains of the lens periphery, the iris, as in the other case, bulged forward, the pupil was not blocked by any visible false membrane, but the

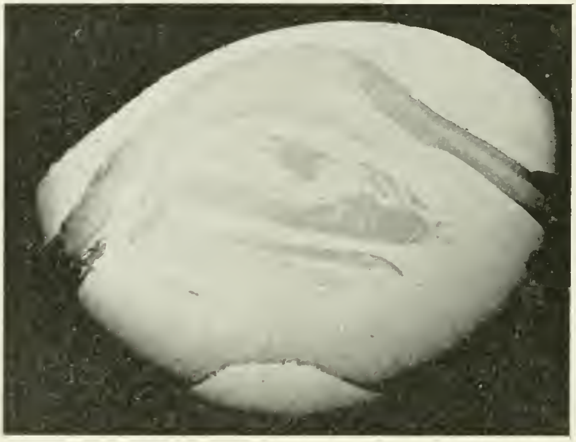

Fig. 8. Glaucoma Secondary to Extraction of Lens, and due to adhesion of the capsule to the corneal wound, a second such adhesion following on a needling, with swelling of soft remains of lens and congestion of ciliary processes.

vitreous body appeared to have opposed the free escape of the fluid from behind the iris, which also adhered to the cornea in the places where the needle punctures had been made. He also reported a few other cases in adults, due to the formation of an inflammatory diaphragm separating the posterior from the anterior chamber. Knapp (49) wrote: "Ten cases in six years, or somewhat more than 1 per cent., shows that this is not a negligible quantity." He extracted by the simple method and opened the capsule above, under the iris, and in nearly every case did a secondary needling. The iris was not incarcerated, and there was no abnormality. Treacher Collins (50) has examined since 1890 eleven more cases. At the London Hospital, Moorfields, between 1885 and 1889, .64 per cent. of eyes operated upon for senile glaucoma had been lost from increased tension. There the extractions were generally done by the combined method. Many cases are lost from serous cyclitis (or iritis), but those with which Collins was dealing were the cases which heal up and then become glaucomatous at a time varying from the union of the wounded tissues to a year or more. "In all eyes in which glaucoma comes on after extraction of the cataract there is adhesion or entanglement of the lens capsule in the extraction scar. This adhesion or entanglement holds the root of the iris, or the anterior of the ciliary processes, if the iris have been removed up to the periphery, in close contact with the back of the cornea in the region of the coloboma, and so keeps the angle of the chamber blocked in that situation. The advanced position which the capsule takes, by reason of its attachment to the cornea, draws forward the iris lying in front of it, and in this way approximates the root of the iris elsewhere than in the region of the coloboma. to the periphery of the cornea." Should the adhering tag be of inflammatory material, as sometimes happens, it is by its slow contraction that the angle becomes gradually closed. A needle operation may cause adhesion between capsule and cornea, and "leads sometimes to the onset of increased tension without any second adhesion, probably either by the swelling of the cortical lens matter so often left in the periphery of the capsule through the action of the aqueous humor on it, or by the swelling of the ciliary processes occasioned by dragging on them by tearing through the capsule. This swelling of the cortical lens matter, or swelling of the ciliary processes, may be just sufficient to push forward the root of the iris into contact with the cornea, which is already abnormally close by reason of the advanced position of the lens capsule. I have one specimen of glaucoma occurring in an eye from which a traumatic cataract had been extracted in its capsule. In it the anterior hyaloid of the vitreous is clearly shown adherent to the cicatrix in the cornea. An adhesion of the hyaloid of the vitreous to the cornea would tend to cause a greater advance in the position of the iris than an adhesion of the lens capsule, because normally it is further back. I have met with two eyes in which the whole iris had escaped through a wound near the center of the cornea, and which afterward became glaucomatous. Until I examined sections of them microscopically the cause of the increased tension in them seemed to be quite inexplicable. In both these eyes the lens had been wounded, some portion of it escaping, a broad adhesion of its capsule to the corneal scar remaining. In the escape of the iris through the wound the anterior part of the ciliary body had become drawn forward, the advance in the position of which had been maintained by the adhesion of the lens capsule to the wound. In both specimens I find the most anterior of the ciliary processes in contact with the posterior surface of the ligamentum pectinatum."

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CHAPTER X.

HÆMORRHAGIC GLAUCOMA; GLAUCOMA SECONDARY TO INTRA-OCULAR TUMORS; ASSOCIATED WITH DETACHED RETINA; FROM DISLOCATION OF THE LENS; FROM SWELLING OF WOUNDED LENS; SECONDARY TO POSTERIOR SYNECHIA, AND TO CORNEAL PERFORATION; AND SEROUS IRITIS.

Hæmorrhagic Glaucoma,

which must be distinguished from hæmorrhage into an already glaucomatous eye, was observed by von Graefe in 22 cases during eight years; Laqueur saw it in 3 per cent. of 268 cases of glaucoma; Risley computed its frequency at 4 affected eyes in 20,000 ophthalmic cases, while Bourgon says it occurred once in 6,741 patients at the Quinze-Vingts Hospital, Paris. It is characterized by an attack resembling that of ordinary acute or subacute glaucoma, taking place at an interval of weeks or even of many months after an intra-ocular hæmorrhage which is usually dependent upon the degenerated condition of the vascular system, due possibly merely to senility, or it may be in association with albuminuria. It may occur, however, in an apparently healthy person at an early age, and then may result from thrombosis of the central vein of the retina, as in a case of a man aged 26, recorded by Weinbaum (1). Opinions are fairly unanimious concerning its pathological anatomy. The filtration angle has usually (Knies (2), Priestley Smith (8), Treacher Collins (4), Wagenmann (5), with propulsion of lens in his three cases; Valude and Dubief (6); Weinbaum (7), etc.,) been found to be closed, but sometimes open (Valude and Dubief, 2 cases in 4, etc.), and the optic disc appears to cup in this just as readily as in other forms of glaucoma, (Valude and Dubief in 2 out of 4 cases, along with thickening of nerve sheaths; Weinbaum's case; Treacher Collins, in one case in a glaucoma of 2½ months' duration, etc.) although the reverse has been asserted. Besides the usual anatomical characteristics of acute glaucoma, there are always present pathological changes in some of the intra-ocular vessels. In the choroid they have been found to be sclerosed and ruptured (*e. g.*, Hache (8); Knies (9), etc.), or enormously distended with blood and with hyaline walls (Randolph (10), etc.); in one of the 4 cases published by Valude and Dubief, normal; and in the other 3, greatly distended with leucocytes. In the iris the vessels have been found hyaline (Valude and Dubief), hyaline and ruptured (Randolph), sclerosed and ruptured (Hache), and with the sheaths infiltrated, while rupture set up inflammation in the tissue of the iris, the ciliary body being similarly attacked (Wagenmann). The ciliary body may also contain enormously dilated vessels (Valude and Dubief). But the retina is the tissue whose vessels constantly show pathological changes, *e. g.*, sclerosis with closure of the lumen of even the largest, and rupture of walls (Hache, Pagenstecher), hyaline degeneration with some obliteration (Valude and Dubief), or sclerosis especially surrounding the central artery of the retina (Brailey and Edmunds (11)). And it is this retinal hæmorrhage preceding the increase of tension which has given the name to this form of glaucoma. I am not aware of any statistics which show in what proportion of cases of retinal bleeding glaucoma appears, but it seems to be the general and well founded impression that it is more frequent among them than among apparently healthy eyes. Considerable dubiety has been expressed concerning the rationale of the appearance of the glaucoma, and some unknown agent is often suspected. It must be observed that we are not speaking of hæmorrhages into the vitreous which act after the manner of a tumor by marked trespass on the vitreous chamber. But, as we have seen, most cases have all the appearances of ordinary acute glaucoma, and the most probable excessive excretion into the vitreous, combined with the congested and even inflamed state so often found in the uveal tract, seems to offer an explanation, as complete as that for any other form of the disease, of the manner in which initial retention at the angle is set up. Nettleship (12) believed that in these cases the eye was probably predisposed to glaucoma; and Treacher Collins (13) said, "the probability is that there is some unknown factor which causes both the increased tension and the hæmorrhages, and that the cases are really analagous to those of primary glaucoma." Valude and Dubief thought that "it is probable that increase in tension of eyes affected by hæmorrhagic glaucoma depends essentially on mechanical obstruction sustained by the whole of the ocular circulatory apparatus," and that "Weber's theory, not applicable to ordinary glaucoma, is so for hæmorrhagic." For such cases as have the angle open some other explanation must be found, resembling possibly that for the high tension of serous iritis, some foundation for which may possibly lie in Case II. reported by Valude and Dubief, in which the anterior chamber was filled with exudates, and in some cases in which the iris and ciliary body have been found abnormal.

Secondary to Intra-Ocular Tumors.

Secondary glaucoma frequently sets in at a certain but indefinite stage in cases of intra-ocular tumor; but the eye may be excised without this having happened. Brailey (14) asserted that the increased tension is preceded by a very slightly diminished tension, and followed, when the eye is not removed, by a very considerable softening. He found (15) on examining 13 cases of sarcoma, 10 of glioma, and 5 of other tumors, that each one with increase tension—all but 5—had also application of the iris to the cornea; generally abnormal calibre, lessened or increased, of the *circulus iridis major:* inflammation or atrophy of the ciliary body and processes, and of the iris, as well as of the optic nerve which had not yet cupped. He had previously found (16) in a group of 10 cases a a similar condition of things. The sequence of events, according to Brailey's opinion, was that a tumor had caused a local inflammation which had spread along the vascular and fibrous tissues affecting the ciliary body, which, along with the resulting hypersecretion of fluid, pressed the iris against the cornea and closed the filtration angle. This is not quite the explanation given by Priestley Smith (17), and supported by Treacher Collins (18), who, however, agree with Brailey in finding that whenever in these cases increased tension appears the iris is applied to the periphery of the cornea, which is not found before that time. They believe that the tumor, which includes hæmorrhage between choroid and retina, obstructs the circulation probably by compression of choroidal veins (Fuchs 19), producing exudation of serum which detaches the retina. This and the advancing growth of the tumor gradually removes the fluid part of the vitreous, leaving only the more fibrous portions, which transmit the increasing pressure from behind to the lens, zonule, ciliary body and iris, resulting in the usual shallow anterior chamber and high tension. Knies, who long ago advocated the hypothesis that not only glaucoma due to intra-ocular tumors, luxation of the lens, etc., but also primary cases, were caused by the secretion of an irritant fluid in the eye, recently renews this theory and refers to Nettleship's description of a condition resembling that named by Knies "glaucoma imminens," a cellular infiltration in the vicinity of the sinus of the anterior chamber and the optic nerve, which Nettleship observed in eyes with sarcoma of the choroid before the development of the glaucomatous symptoms. Knies found inflammation in this situation after the introduction into the vitreous of a strongly irritating fluid, in which he appears to find confirmation of his theory.

Devereux Marshall (20 a) has microscopically examined, with special reference to tension, 100 eyes enucleated for intra-ocular tumor, and concludes that the size of the growth has directly little to do with the degree of tension, increase in which is determined by diminution in size of the angle of the anterior chamber, which is most frequently closed when the choroid only is the seat of the tumor. When the ciliary body is affected diminished tension is not uncommon, and in a majority of these cases there is no increase. In most cases of glioma the tension is normal, in a few it is diminished, and in some it is raised.

Glaucoma Associated with Detached Retina.

In those rare cases in which glaucoma is associated with detachment of the retina in the absence of intra-ocular growth or hæmorrhage the increase of tension appears to be due either to iritis, secondary to choroiditis preceding the detachment, extending forward and resulting in posterior synechia, or to the formation of a highly albuminous fluid in an inflamed ciliary body, a fluid which cannot filter from the angle, and associated with a deep anterior chamber. (E. Nordenson (21), and Priestley Smith (22.)

Glaucoma from Dislocation of the Lens.

The lens when displaced *into the pupil* is apt to cause increase of tension by interfering with the forward passage of fluid and when *into the anterior chamber*, the iris being pressed forward against it and against the cornea, a similar difficulty results at the pupil and also at the angle, which may at once disappear on the lens resuming its normal position when the patient lies on his back, or when the pupil is sufficiently dilated by atropine. When the lens retains its position behind the iris, but is dislocated *to one side*, it has been found to cause glaucoma by being forced by the vitreous against the ciliary body and iris, whereby these are brought in contact with the cornea in a greater or less segment of the circumference, or even the whole of it through the additional agency of the vitreous itself at the place vacated by the lens (Priestley Smith, 23). When displaced *backward* the *plus* tension is due to a "relative alteration of position which has taken place between the lens and the vitreous body directly forcing forward the root of the iris into

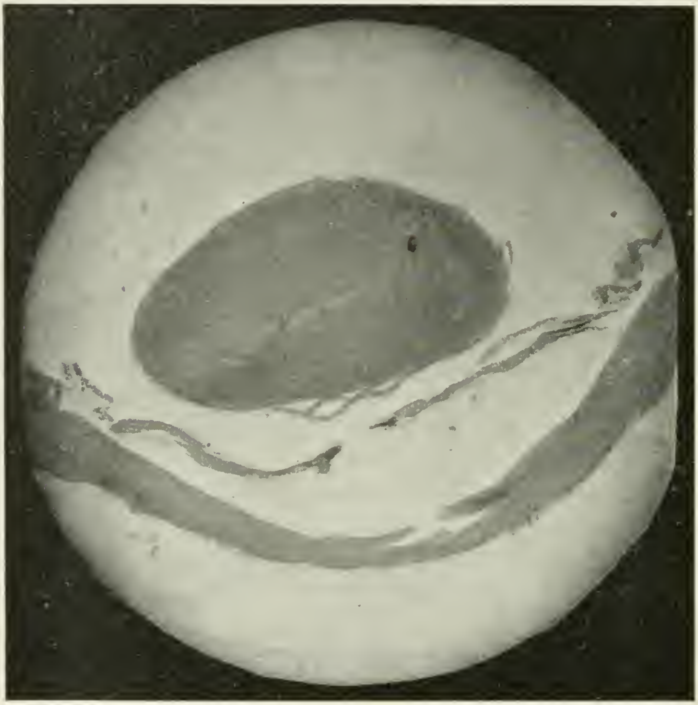

Fig. 9. Glaucoma Secondary to Lateral Dislocation of Lens. The suspensory ligament was torn, and the vitreous protruded between the lens and the ciliary body.

contact with the cornea, so closing the angle of the anterior chamber, for in these cases the angle is always found closed." (Treacher Collins, 24.) Galezowski (25) in two cases of dislocation of the lens downward concluded that the resulting glaucoma was due to obstruction by the lens of the lymph channels. The above is undoubtedly the best founded explanation of these cases, though Schweigger (26) opposed it and asserted, on what scientific grounds I do not know, that the increased tension is due to an irido-choroiditis; and Brailey (27) suggested long ago an iritis "of the same kind as iritis serosa."

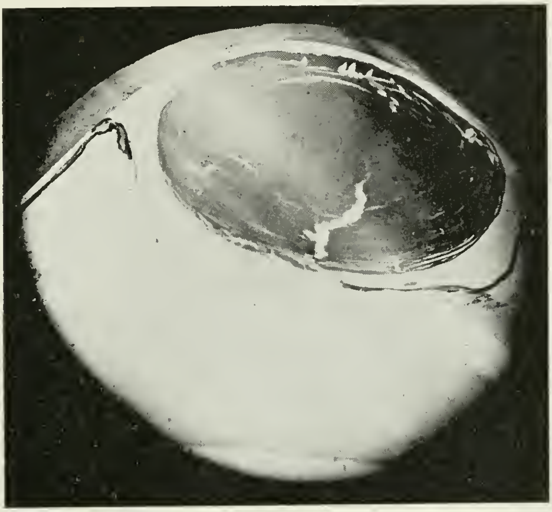

Fig. 10. Glaucoma Secondary to Dislocation of Lens Into Anterior Chamber. Angle on one side blocked. Eserine in this case increased the tension, and atropine diminished it.

Swelling of Wounded Lens.

After an acccidental or intentional wound of the lens the eye has to be carefully watched on account of the possibility of increased tension, due to blocking of the pupil by lens matter or displacement of the iris forward. This is not at all an uncommon occurrence after for needling lamellar cataract. The removal of the lens will permit of a return of the normal tension.

Glaucoma Secondary to Posterior Synechia.

There is little doubt that the usual explanation of the sequence of glaucoma upon total exclusion of the pupil, by adhesion of the iris to the anterior capsule of the lens, is the correct one, viz., that in this way fluid is prevented from leaving the posterior to enter the anterior chamber, the iris is bulged forward, "bombé," and when left to itself becomes adherent at its periphery to the cornea, while the high tension causes atrophy of the ciliary body, etc.

It is true that it sometimes happens that apparent total posterior synechia exists without *plus* tension, but it must be borne in mind in these cases either that the completeness of the synechia may be only apparent, or that diminished excretion from the ciliary body due to atrophy after participation in the inflammation which caused the synechia, or atrophy of the iris itself permitting of the passage through it of fluid, will generally account for this anomaly. Against the above theory of this form of secondary glaucoma a few dissentient voices have been raised. For instance, Schweigger (28) and Rheindorf (29) asserted that a dragging on the ciliary body would account for all the symptoms by causing hyper-secretion of fluid; and Ulrich (30), who held that normally fluid passes forward into the anterior chamber through the iris, considers the usual explanation much too simple. According to him in the iris thickening of tissue and destruction of vessels take place, making it impervious, and also causing a collateral hyperæmia with hyper-secretion from the ciliary processes, the latter being more important than the retention. That there should be any fluid at all in the anterior chamber in these circumstances proved to his mind that it passed through the iris.

Glaucoma Secondary to Corneal Perforation.

The adhesion of the iris, lens capsule, or vitreous to the cornea as a result of ulceration or wound of the latter is apt to result in glaucoma after the closure of the perforation has stopped leakage from the eye. The same thing may be seen in staphyloma of the cornea or ciliary region, the bulging perhaps increasing for a time till the wall gives way, and lowered tension permits of healing when the same process is repeated, possibly until by the access of infective material to the interior of the eye, a uveitis is set up which ends in complete destruction. Brailey (31), who reported on the examination of 50 cases of glaucoma following on perforation of the cornea, was of opinion that increased tension was not directly due to the universal presence of a closed angle, but that the hypersecretion with which it was associated from dragging on the ciliary body was primarily of consequence. Ulrich's (32) idea as to the etiology of such cases, published at different times, differs from Brailey's. He founded his theory mainly upon observations on a case of gonorrhœal ophthalmia without necrosis of the cornea and complete posterior synechia, in which after five months the eye had healed over with good perception of light and normal tension; and of eleven cases of artificial removal of the cornea with adhesion of the iris to the scar in rabbits. Four of these eyes became glaucomatous at times varying from one to three months after the production of leucoma, with bulging of the cicatrix, etc. In five cases the increase was inconstant or uncertain, and in the remaining two the globes softened. The differences noted in the condition of the glaucomatous eyes from that in the others were that in the latter the pupillary portion of the iris was less adherent, and that there was less deposit of pigment in the ciliary processes, showing less chronic hyperæmia. Still hypersecretion had been demonstrated during life in both sets of cases, but though Ulrich claims for it the important part in developing the glaucoma it did not do so in the majority of these. In the gonorrhœal cases *plus* tension came on as soon as fibrous degeneration of the exposed iris had developed. He explained his theory in these words (33): "The immediate effect of an extensive incarceration of the iris in the corneal defect is, besides the mechanical imprisonment, traction upon the iris and the corresponding part of the ciliary body, and partial narrowing of the anterior chamber and Fontana's spaces. We notice an immediate hyperæmia of the ciliary processes and an increased production of the aqueous humor. The mechanical incarceration of iris tissue acts directly, and the secondary degeneration and atrophy act indirectly to produce disturbances of the circulation in the iris. My experiments on animals have convinced me that incarceration of the pupillary portion of the iris produces glaucoma more readily than peripheric incarcerations. The reason for this seems to be that the former encloses a larger vascular area than the latter." In considering these observations of Ulrich's one comes to the conclusion that, however interesting they may be, they fail adequately to support his theory, if he means by it that hypersecretion without retention suffices for the production of the increase of tension, because he admits hyper-secretion in both the glaucomatous and the non-glaucomatous groups; because, as is well known, atrophic irides, such as these were, may easily allow of the filtration of fluid to the angle of the anterior chamber; because normal or sub-normal tension may result in such cases from the degeneration of the ciliary body which is so likely to accompany a similar process in the iris; and because minute fistulæ in the cornea, easily overlooked, might admit of a constant drainage of fluid. Priestley Smith (34) gave illustrations, among his other excellent drawings, of the best explanation of glaucoma secondary to corneal perforation, viz., that on the emptying of the anterior chamber iris, lens, etc., are pressed forward, and the iris, or even the lens capsule, becomes entangled and ultimately adherent in the corneal wound, which if tolerably complete, will prevent the

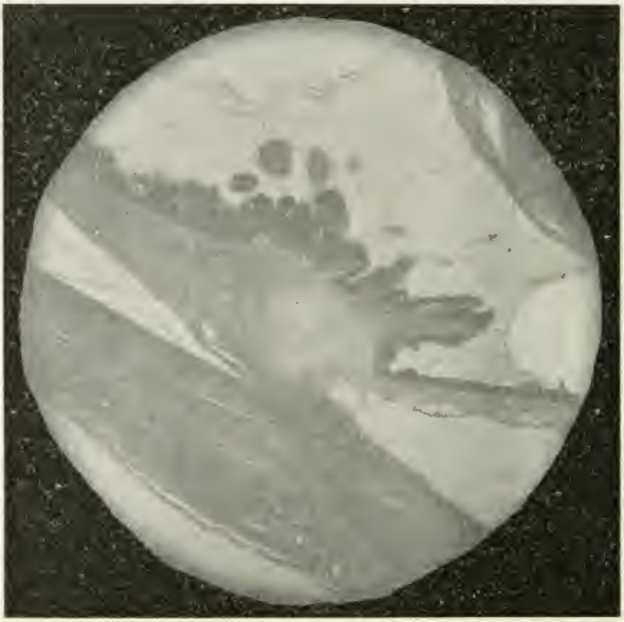

Fig. 11. Sympathetic Cyclitis with High Tension and Deep Anterior Chamber, due to excessive secretion and blockade of the angle of the anterior chamber by cellular matter. The Lens was cataractous.

fluid from passing round into the anterior chamber, or simply by bringing the periphery of the iris in contact with the cornea, when less complete, block up the filtration angle.

Serous Iritis.

In serous iritis it is now understood that the ciliary body is principally at fault. Into the symptoms of this disease it is unnecessary to go here, beyond remarking that it is frequently characterised by increased intra-ocular tension along with an anterior chamber as deep as, or deeper than, normal. On section there is always found much cell infiltration near Schlemm's canal and in the ciliary body (Brailey (35)), without atrophy of the ciliary muscle (Brailey and Edmunds (36)). While serous iritis is not included among the forms of primary glaucoma it may yet lead to a secondary form of the disease with deep cupping. The cause of the increase of tension is believed to be a change from the normal in the composition of the aqueous fluid, whereby it contains, besides pigment and leucocytes, an excess of albuminous matter which result in a diminished power of filtration into the channels of exit, especially when these are more or less blocked by cells (PriestleySmith 37, Treacher Collins 38). This is a true example of a *plus* tension due primarily to a block at the angle of the anterior chamber, and may be compared in its effects on the depth of that chamber with the *plus* tension due to a hindrance in a similar position according to the theory of Knies.

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CHAPTER XI.

SIMPLE GLAUCOMA.

Simple glaucoma was said by von Graefe (1) to affect almost without exception both eyes successively; Nettleship (2) stated that in something like two-thirds of their number cases of chronic glaucoma are sooner or later bilateral; Stedman Bull (3) thought that probably in 80 per cent. both eyes become affected. We have seen that the symptoms of glaucoma may pass by slow gradations from those of an excessively acute disease, marked by great pain and every appearance of congestion, and leading rapidly to loss of vision, to a condition in which all such signs are lacking, and little or nothing is apparent to denote a deviation from the normal beyond a certain visual deficiency associated with cupping and pallor of the optic disc, in many cases a picture hard to be distinguished from that of optic atrophy. These latter facts have given to simple or chronic glaucoma a peculiar interest, which, though it existed in full force in von Graefe's time, has diminished little to the present day in spite of the great advances which have been made in recent years in our knowledge of glaucoma as a whole. This interest centers chiefly round three points, viz.: (1) Is this disease really glaucoma at all? or is it something else? (2) If it is a glaucoma, will explanations applicable to the acuter forms of the disease meet the case of this also? or must some other be produced? And (3) is it advisable to apply the same treatment for this as for the more distinct types?

The first two of these questions at once lead us to the observation that there has long been, and still is, a divergence of opinion on the subject among the most eminent ophthalmologists. Thus, for example, von Graefe said he could not too strongly insist "that in the present state of our knowledge the optic nerve affection alone is not sufficient to warrant a diagnosis of glaucoma; in many instances it has a patho-genesis entirely distinct from the latter disease." He called it "amaurosis with optic nerve cupping," while Edward Jaeger and Stellwag marked their uncertainty by designating it respectively "glaucomatous optic nerve disease" and "excavation atrophy."

Jacobson (5) separated glaucoma simplex from all other forms, as did Knies (6), who said that von Graefe's designation was still applicable, both clinically and pathologically. Nettleship (7), while referring to the "disc appearances of glaucoma where there is none," and to the possibility of atrophic changes in a nerve head in which there had previously been a large physiological cup, producing an excavation resembling that of glaucoma, yet bore strong testimony to the unwisdom of the least carelessness in diagnosing as some other disease cases having discs resembling those of glaucoma, simply because the disc appearances may be the only ones suggestive of glaucoma, which the cases may ultimately prove themselves to be by the development of other and distinctive features; or, in his own words, "we cannot but be very careful in inferring that a person whose discs show changes resembling those of glaucoma is really safe, however free he may be from symptoms or other signs of the disease." Nettleship illustrated by a few examples the wide range in the duration of chronic glaucoma before the accession of blindness, which, however, occurs usually within two years, thus:

Captain ———, myopic 2.5 D. had after simple glaucoma for 20 years a visual acuity of $^6/_9$: he then was acutely attacked, and was blind three years later. Miss ——— was glaucomatous for 9 years before her vision was very materially affected. Mr. R. was blind in the right eye from glaucoma, and, while at the age of 76 the left had been subject to the disease for 6 years with T +, vision was still $^6/_{18}$. 'As suspicious cases, which had not developed at the time of publishing his paper, the author gave: Mrs. MacR., age 48. In 1881 both discs were very suspiciously cupped, and in 1885 had not changed, the vision also remaining $^6/_6$. H. M.—0.75 D. and T.n; also Mrs. B., age 57, in 1884, M. vision with glasses $^6/_{18}$, discs cupped and pale, T + slightly; in 1888 sight was still good. "That such suspicious appearances may precede the outbreak of rapid glaucoma is proved by" Mrs. G., age 40. In September, 1885, right eye had central, large, very steep "physiological" cup, quite different from that in the left. The right eye suffered from subacute glaucoma three months later. Cases also occur of real glaucoma in one eye, with very deep and large normal cups in the other, as that of Dr. ———, one of whose eyes was excised for absolute simple glaucoma, with retinal hæmorrhages and pain. For the previous two and a half years he had had a pale disc, cupped all over to the depth of 1 m.m. Vision $^6/_6$: field full, T.n. There were at one time hæmorrhages in this eye, also, which absorbed. In Edward S's case an iridectomy in 1883 cured subacute glaucoma in the right eye. Two years later the disc presented a large physiological cup, which was rather pale. The left, with vision of $^6/_6$, had a deep physiological cup. Mr. G.,

(To be continued.)

A NEW INSTRUMENT FOR TESTING THE EXTERNAL OCULAR MUSCLES.

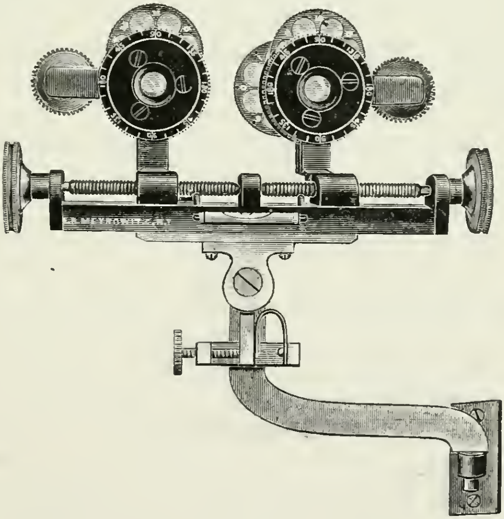
By G. Griffin Lewis, M. D.,

Syracuse, N. Y.

Illustrated.

The profession has long been in need of an instrument which will accurately, and, at the same time, rapidly denote the strength of the various external ocular muscles.

In order to do this it is necessary that the test should not be fatiguing to the eyes; that the change in the power of the prisms could be such as not to allow a relaxation of the muscles under test; that the position of the testing prisms should be exact; that the change in the strength of the testing prisms should be a rapid increase, and that the instrument should be one which can be easily manipulated in the dark.



I feel assured, after a thorough trial with the model, that I have succeeded in designing an instrument which possesses all of these desirable qualities.

As shown in the accompanying illustration, it is supported by a telescopic standard which can be elevated or lowered as the case may require.

On either side of the instrument are thumb-screws for regulating the pupiliary distance.

Before the left eye are two revolving discs, which we will designate as discs Nos. 1 and 3, and before the right eye is one disc, which we will designate as disc No. 2.

Disc No. 1 contains an aperture and prisms of 1, 2, 3, 4, 5 and 6 degrees. Disc No. 2 contains an aperture, prisms of 7, 14, 21, 28 and 35 degrees and a red glass.

Disc No. 3 contains an aperture, a red glass and a prism of 2, 4, 6, 8 and 10 degrees.

With discs Nos. 1 and 2 any combination of prisms from 1 to 41 may be obtained, and should the operator, in any case, desire to use still stronger prisms, he may, by the combined use of disc No. 3, run it up as high as 51 degrees.

The prisms in each disc are fixed with their apices toward the center of the disc, which has two motions; first, a rotation on its own axis, thus changing the prisms before the aperture through which the eye looks; second, a rotation around the aperture, thus changing the axis of the prism in use and enabling the operator to direct its apex up, down, in or out, according to the muscles he wishes to test. This latter motion is obtained by revolving the small wheels at the side of the disc.

Disc No. 3 is intended more especially for the measurement of any existing diplopia or muscular insufficiency, or, if desired, may be combined with the other discs in testing the internal recti muscles.

The number of each prism is marked on the disc where it can be easily seen by the operator, and the different axis of the prisms are indicated by numbers on the circular piece to which the disc is attached. After the operator once gets acquainted with the instrument, however, it will not be necessary for him to look at the numbers until the test of each set of muscles is completed.

Every time the apex of the prism before the aperture is directed up, down, in or out, a little spring catch holds it in position, so that in changing the position of the prism before the aperture, there is no danger of rotating the disc also. In the same manner, every time there is a change of the prism before the aperture, another spring catch holds it in position.

With this instrument any of the recti or oblique muscles may be tested, any existing diplopia or muscular insufficiency may be measured, or it may be employed to give rhythmical, graded exercise to any of the external ocular muscles.

The lenses are easy to clean, the parts difficult to get out of order, its use is not fatiguing to the patient's eyes and, on the whole, it seems to be all that could be desired as a phorometer.

To Mr. E. B. Meyrowitz, maker of this instrument, I am indebted for the skilled workmanship and the illustration.

OCCLUSION OF THE ARTERIOLES SUPPLYING THE MACULA LUTEA.

By Dr. H. Gradle.,

CHICAGO.

The infrequency of the following observation, as well as the intricate diagnostic problems which it suggests, seem to the writer a sufficient motive for its publication:

Mr. J. was injured in June, 1883—then at the age of 25 years—by the entrance af a minute chip of iron into the left eye. I saw him three weeks after the accident, when the eye was free from any irritation, but the lens cataractous. A minute scar in the cornea and a rusty speck on the lens capsule indicated the path of the foreign body, which could not have exceeded pin-point size. In view of the absence of all irritation I decided upon a discission which, likewise, caused no reaction. Within two weeks considerable absorption had occurred. The patient felt no annoyance and as he wished to work in the town where he lived, left Chicago against my advice and did not return.

The sight of the operated eye improved until he could see fingers. Not being annoyed by the eye he paid no further attention to it. He was a mechanic in a railroad shop, and had no difficulty in his work. His health had been good up to the year 1894. During this year, however, and perhaps a little earlier, he began to have transient headache after close eye-work, especially after reading. In July, 1894, he had an attack of dizziness with faintness, nausea and vomiting, lasting about one hour, and followed by diffuse headache for another hour. Attacks of this kind of variable severity recurred at intervals of weeks until January, 1895, since which time he has had no more dizzy spells. He had, however, periodic attacks of headache, especially severe during the month of April. During May there was less headache, but he felt nervous and had occasional "twitching" of the right eye. At no time did he stop work. His dizzy spells had been attributed by a physician to "dyspepsia," and he had been treated accordingly, but without noticeable benefit. During May the right eye became suddenly blind for a few minutes on two separate occasions, each time with complete recovery. But on June 13, while stooping, sight left the right eye completely. The next day the peripheral sight returned to a sufficient extent to allow him to get about, but central vision seemed practically gone, and this condition remained unchanged when seen by me one week later, June 20, 1895.

The left eye presented no anomaly except slight capsular cataract, the lens having been entirely absorbed. It counted fingers at 5 feet distance. The right eye showed a slightly enlarged and sluggish pupil. The tension was normal. *Moderate pressure upon the eyeball was distinctly painful.* Ophthalmoscopically the media were clear.

The optic nerve and all visible vessels were normal. Adjoining the edge of the disc there was a very delicate haze of the retina in the upward and temporal directions, while inwardly from the papilla perfect retinal transparency existed. This haze increased to distinct whitish cloudiness in the region between the disc and macula. The vessels in this area were normal in size. In the temporal part of this cloudy area there was a striking cherry red spot surrounding the fovea, the reflex of which could be definitely recognized. The red area was about one-third to one-half as wide as the optic disc and its color shaded off gradually.

The vision was barely equal to counting fingers 2 feet off. Excentrically, however, he could distinguish fingers at 5 feet distance. There was a central scotoma, with well defined outlines extending 5° upward and downward and 6° laterally in each direction from the point of fixation. Notwithstanding his poor sight the patient could maintain a very steady fixation. Within the area covered by the scotoma he could recognize no colors, but could see pronounced contours. The scotoma appeared to him as a misty zone but *not* as a dark shadow. His peripheral vision was scarcely perfect, since the field was short about 10° at each end of the horizonal meridian, and the zones of color vision were rather restricted as compared with the average. Moreover he had deficient perception of green—probably congenital, as it was the same in both eyes and did not change during subsequent observation.

After massaging the eye and the inhalation of nitrate of amyl until the effects were felt, the scotoma became less dense, so that large print, which had before been invisible within the blind area, could now be seen, though not read.

I sent the patient to Dr. N. S. Davis, Jr., for examination of the circulatory system, which was found absolutely perfect. Urimalysis, too, showed no anomaly.

The subsequent history was the following: The tenderness on pressure diminished within the first four days and could not be recognized one week later. The excentric vision became normal within a week, and by this time he had acquired the natural certainty of sight in locating and interpreting objects, even with the left eye closed. The central scotoma did not shrink in size, but cleared gradually in a centripetal direction, so that some months later it had become difficult to outline it. The central sight, which had probably begun to improve at once after the accident, continued to do so under my observation. Even one day after the first examination he began to distinguish colors within the scotoma. Two months later he could see $\frac{20}{200}$ Sn., but this was not perfectly direct vision. Nearly one year later (May 30, 1896) the state of sight was about the same. The scotoma was demonstrable, but V diminished so gradually from the edge of the scotoma toward its center, that topographical measurements were uncertain.

The improvement of sight was accompanied by the disappearance of the visible lesion. The pupillary reaction appeared normal in the course of the second week.

The cherry red color of the macula was less pronounced within four days of observation and had vanished at the end of the third week. The circumscribed retinal cloudiness was also gone by this time. There were seen, however, a few white glistening specks in the—formerly cloudy—area; presumably cholesterin crystals. One month after the accident no ophthalmoscopic anomaly could be found.

When re-examined one year later there was slight pallor of the temporal part of the papilla. The arteries throughout the central area of the retina were of less than normal caliber. The superior nasal vein showed a double contour (perivasculitis) near the papilla. No other objective anomaly could be seen. The refraction of the right eye, determined by retinoscopy, was one dioptory of myopic astigmatism.

The treatment begun on the first day (one week after the accident) was the local use of eserin, daily massage of the eye by myself or the patient, and the internal use of K I (1 gram doses) and of pilocarpin. Eserin and pilocarpin were only continued for a week, the iodide was given during one month. The rate of improvement being about the same before the patient was seen, as well as for another month after all treatment had been abandoned, I can see no proof that this part of the treatment was of any influence. During the first two examinations the patient's sight seemed at once subjectively better, and perhaps a trifle objectively improved after nitrite of amyl inhalation and massage. But I could not assure myself that any decisive or lasting benefit was thus obtained.

On July 9th (4 weeks after the accident) I made a crucial discission of the membranous cataract of the left eye. No reaction followed, and two weeks later a convex glass of 12D with cyl. + 1.25 axis vertical, gave Mr. J., sight $\frac{20}{40}$. Ten months later the vision had fallen slightly (to $\frac{20}{60}$), but with his stronger glass (for near work) he was able to work in a machine shop.

Since the time of the accident the patient has never had another headache. He has noticed at times slight dizziness on stooping, but much less than formerly. The vertigo is more apt to come on when without glasses than while he is wearing them.

The only satisfactory explanation of the sudden occurrence of blindness in the patient is obstruction of the arterial branches supplying the macular region. This view is confirmed by the early appearances indicative of embolism, viz., the localized (and transient) retinal cloudiness, and the well-known cherry-red figure corresponding to the fovea and its surrounding region.

The macular branches have been found exempt and patent in embolism of the central artery in a number of instances. (Twenty cases are quoted by Laqueur in the Oct. number of the *Archives of Ophthalmology*, 1896). I can find, however, but three cases on record in which the macular branch was obliterated without embolic occlusion of the other retinal arteries—one by Hirschberg (*Centralblatt f. Augenh.* 1885, p. 38); one by Perles (*Idem*, 1891, p. 135), and another by Perles (*Idem*, 1892, p. 461), in which embolism involved the macular branch as well as the superior nasal artery of the retina. All these instances were characterized by a central scotoma in the midst of an otherwise normal field of vision (except the last complicated case of Perles). The description of Hirschberg and Perles convey the impression that the scotoma was absolute. In my case the scotomatous area was not totally blind when examined on the seventh day, and the vision in this region improved steadily for several months until it reached $\frac{20}{200}$. The scotoma of my patient was more entirely symmetrical around the point of fixation than in the other cases quoted, a peculiarity probably dependent on individual variations in the vascular distribution. The partial persistence and moderate restoration of central vision cannot be attributed to collateral circulation, as all retinal arterioles are "terminal" in their distribution. It can be better explained by assuming that the area deprived of its blood-vessels was nourished like the normally avascular fovea—by a current of serum from the choroidal, as well as the adjoining retinal capillaries. This supply, however, did not suffice for adequate nutrition. It is to be remembered that all autopsies in retinal embolism have shown degeneration only of the internal layers of the retina, but integrity of the rods and cones, and that the nerve fibres reach the macular region essentially by an arched path and are hence nourished during part of their course by capillaries not dependent on the macular arterioles.

The macular region is usually supplied by two branches which often emerge from the central artery before it divides into the familiar four large retinal arteries, and then run horizontally across the papilla. Sometimes the ophthalmoscope shows only one such macular arteriole. In my patient *no macular arteriole was to be seen* at any time. This minute vessel is evidently only visible when filled with blood. Its invisibility is, therefore, strongly suggestive of its total exclusion from the retinal circulation, as in many instances of complete retinal embolism the smaller arterioles are lost to view.

The examination of the patient furnished no clue as to the origin of the embolus. The heart and vascular system were found normal by Dr. Davis. No indications of arterio-sclerosis could be detected and even the sphygmographic tracing was normal. The question has been raised by Priestley Smith (*Ophth. Review*, Jan. and Feb. 1884) whether some cases of apparent retinal embolism are not in reality due to thrombosis of the artery. It is especially those instance in which transient attacks of blindness—even in both eyes—and spells of dizziness precede the final vascular obstruction, that he attributes to local thrombosis. His views, however, unsupported by pathological evidence, cannot be considered definitely established. Yet in the present case there are various points which favor the assumption of localized disease of the blood vessel involved, viz., the absence of any recognizable source of the embolus, the history of preceding spells of vertigo, presumably dependent partly on blood changes and especially the *decided tenderness to pressure* upon the eyeball. This latter symptom, which did not persist many days, suggests some form of retro-bulbar inflammation, which could not be localized in the absence of other symptoms. Localized disease of the blood vessels would also explain more satisfactorily the two previous transient attacks of blindness, as well as the complete involvement of the entire retina at the time of the onset.

What is the significance of the periodic attacks of headache, often preceded by vertigo and nausea, of which the patient complained for nearly a year before the blindness? It must be remembered that the headache never returned after the accident to the eye, but that the patient was yet at times annoyed by slight dizziness. Many oculists must have observed—like myself—instances in which such spells of vertigo, nausea and headache ceased permanently after the correction of astigmatism by appropriate glasses. The patient had myopic astigmatism of the right eye of about one dioptry, as measured by retinoscopy. Indeed, even with his imperfect vision a cylinder of one D was accepted when placed in the proper meridian, while other glasses or the same one at an improper angle were refused. The subjective test was, of course, but approximative, but it agreed with the objective measurement. The almost total extinction of central vision may be compared in its effects to permanent rest of the eye, and it seems hence no improbable view that the periodic spells of vertigo, nausea and headache, as well as the more irregular form of headache without dizziness represented a migrain dependant upon eye strain, which ceased after the eye had lost its function of acute sight. The capsular opacity of the aphakic left eye and the subsequent adaptation of glasses after discission excluded the left eye from the etiology of the reflex neurosis.

But while defending the etiological relation of the astigmatism to the nervous symptoms, I do not maintain that this is a complete explanation of his spells. I have elsewhere[1] tried to show that reflex-neuroses of peripheral origin do not occur in persons with strictly normal nervous system, and that their very occurrence is proof of nervous instability of which other evidences can usually be found in these patients. The astigmatism was probably the peripheral source which induced the headache and the "nerve-storms" of nausea and vertigo, but without other prejudicial influences acting upon the nervous system the optic defect could not have led to such consequences. What the other predisposing conditions were in the present case cannot be stated with certainty in the present state of our knowledge. It is, however, not unlikely that some general chemical disturbance, which we cannot analyze as yet, prepared the way both for the reflex disturbances of this patient and the localized vascular diseass which caused his blindness.

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[1] "A Clinical Study of the So-called Reflex-neuroses," *Jour. Am. Med. Assoc.*, June 9, 1894, and "The Neurological Aspect of Asthenopia," *New York Med. Record*, Dec. 7, 1895.

ELECTROLYSIS FOR XANTHELASMA.

By Francis B. Kellogg, M. D.,

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Xanthelasma is honored by a short paragraph in most of the treatises on the eye. It is generally described as a fatty degeneration of the connective tissue element of the skin of the eyelid. The striking and ugly yellow patches are familiar to us all, and it has seemed to me of sufficient importance, from a cosmetic standpoint, to warrant the report of a case, treated, so far as I am aware, by a new method, viz.: Electrolysis.

The use of the electric needle in removing moles and other dermal excrescences suggested its employment in this case. Excision is the only treatment mentioned by the authorities to my knowledge, and that is discouraged.

The case in question was that of a middle aged lady of the brunette type. The loose integument of the eyelids was deeply pigmented, as is usually the case in xanthelasma. On each upper lid, toward the inner canthus, was a patch of xanthelasma about one centimeter long by one-half that in width, and of irregular shape. It was raised somewhat above the level of the surrounding skin and stood out in striking relief against its brownish color. At one side of the left plaque was a small spot of the same character about the size of a pin's head. I decided to try the electrolysis first on this, and to be guided as to its further use by the result.

Using six cells of the chloride of silver dry cell galvanic battery, and having the patient hold the positive sponge in the hand, I inserted the needle attached to the negative pole into this small spot, at two or three places, keeping it there long enough to change the color of the part and elicit the hydrogen froth.

In two weeks the patient returned, and in place of the yellow spot was a pinkish area of new skin. She reported that there had been no scab and no soreness. The new skin, while presenting some contrast in color to the pigmented lid, was such an improvement over the dingy yellow of the xanthelasma that I was much pleased and my patient was even more so.

I now attacked the large patch upon the right lid. Before inserting the needle I injected a couple of drops of a four per cent. solution of cocain. I then electrolized two spots upon opposite sides of the patch, each about two mm. in diameter.

At this time I ventured to use eight cells, and the consequences, while not serious, decided me never to use over six again. There were some flashes of light in the eye on applying the current and there was a soreness left in the eye which did not entirely disappear for two weeks. Of course the eye, being practically a sack of water, is an excellent conductor of electricity, which exposes its delicate structures to the full strength of the current. I regard six cells as the limit of strength in applying the galvanic current to the eye. I think five, or even four, with a longer exposure is still better.

The amount of tissue which I destroyed at the second sitting was small as compared with the whole of the patch, being not over one-third of the same. At the end of two weeks more the patient returned. The small area first treated had improved still further in appearence, and the areas treated at the last sitting, which had scabbed over, presented two depressions where the scabs had come off. These were covered with new skin. There had also been a contraction of the whole plaque, and considerable absorption of the degenerated tissue outside the areas of treatment.

As the healing process was incomplete I gave it another week; at the end of which time the results of absorption were still more marked. There only remained two small points to be treated.

As the patient was to leave the city the next day I treated the large plaque upon the left lid at one sitting. In this case I used only four cells, leaving the needle longer in the tissue at each insertion. The current was so weak that no froth appeared. I went over the patch pretty thoroughly, and its color was decidedly changed. My purpose in using the weak current was not only to avoid irritating the eye, but also to avoid destroying sufficient tissue at any one point to result in scab formation and pitting. The action of the electrolysis at the first treatment suggested that it might sufficiently modify the character of the fatty tissue to change its color without going to that extent.

The case has passed from under my observation, and I doubt if I shall have an opportunity to report upon the ultimate result of the last treatment. The success of those preceding, however, was so encouraging as to justify putting it upon record.

PAINLESS PANOPHTHALMITIS FOLLOWING CATHETERIZATION FOR RETENTION DUE TO ENLARGED PROSTATE. DEATH FROM ABSCESS OF THE BRAIN.

By F. W. Marlow, M. D.,

SYRACUSE, N. Y.

Mr. M., aged 70, as the result of riding a bicycle with an imperfect saddle developed some irritation of the prostate, and retention of urine occurred on June 13, 1896. The water was drawn off on June 14th, by a large metal catheter, also on the 15th and 16th. On the 15th he had a chill, and a temperature of about 103° F. The date at which the eye trouble commenced is a little uncertain, the patient stating that the symptoms began on the first or second day following the cathetrization; the attention of the physician, however, not being called to it until the 23d of June.

I saw him first on June 25th. He gave a history of a liability of the left eye to attacks of inflammation during childhood, and for many years afterward, but none has occurred in the past thirty years. The nature of the attacks could not be ascertained, but it seemed probably clear that they produced no affection of vision.

The present inflammation commenced within a very few days after catheterization, and was characterized by redness of the eye, swelling of the lids, eversion of the lower lid, and loss of vision, which latter symptom occurred within forty-eight hours of the onset. There was no pain.

Upon examination great proptosis with eversion of conjunctiva of the lower lid was at once apparent. The globe was intensely congested, the cornea transparent but slightly dull on the surface, the anterior chamber decidedly shallow, the iris muddy and discolored, the pupil small, immobile and filled with a yellowish gray exudation. T + 3. No perception of light; the eyeball not at all, or but slightly, tender to the touch, and almost completely motionless. It seemed to be protruded toward the lower margin of the orbit. The protrusion of the eyeball and the swelling of the orbital tissues were so marked that it seemed probable at first that the case commenced as one of orbital cellulitis, and the swelling on the conjunctiva of the lower lid, and its adhesion to the eyeball, suggested that the starting point of the inflammation was situated in the lower part of the orbit, and the question of suppuration extending from the antrum was raised.

History and investigation showed that this was normal, and as treatment did not produce any improvement in the condition of the eyeball, it became more evident as time elapsed that the case was one of primary panophthalmitis, with secondary infiltration of the orbital tissues. Enucleation was advised and performed on July 4th. The eyeball was matted to the orbital tissue, and it was impossible to distinguish the muscles from any of the other tissues. During the operation the eyeball was cut into once, close to the insertion of the superior rectus muscle, pus at once escaping. There was no pus in the orbit. The optic nerve was cut long, and the cut end was normal in appearance. The patient bore the etherization and operation well, and his temperature remained normal for two days after the operation. The enucleation wound pursued an uneventful course,—discharging a considerable amount of pus at first. This and the swelling of the orbital tissues gradually subsided, and the wound healed, the conjunctival sac assuming the appearance usual after enucleation. There was no reason at any time to attribute the febrile symptoms to the condition of the orbit.

July 7th. At 9 a. m. pulse 86, temp. 100.2° F.
At 4 p. m. pulse 100, temp. 102,4° F.

July 8th. Had a comfortable night, but pulse remains at 100, and temperature at 100.6° F. At 4 p. m. 101.6° F.

The fever continued with slight variations until July 12th, when the temperature fell to 98.4° F., and the pulse to 94. During the whole of this time there were no chills, no cough, and the condition of the bowels was not such as to account for the symptoms. Examination of the chest disclosed nothing wrong. There was a definite but slow loss of flesh, and although answering questions rationally, he showed disturbance of mental condition in talking of getting out of the window to reach the street car, and in the persistent idea that the general physician in attendance wished to poison him, etc.

He left the hospital on July 17th, and was well enough to come to my office once or twice during the next two weeks. I did not see him after these visits. I learned from the attending physician, however, that he gradually became more emaciated, grew deafer, until the second week in August, when he had a chill.

A day or two later the *left side* became paralyzed, the feet and hands being cold for a day or so, and then getting warm again. About five days after the chill he became comatose and died. This occurred while I was absent on my vacation, consequently I was unable to be present at the autopsy, which was, unfortunately, limited to an examination of the brain. This was examined by sections, made vertically in a transverse direction, and revealed the presence, in the left hemisphere, of an abscess cavity in the white substance situated opposite the corpus callosum, the greater portion of it being above the level of that body and extending outward to the gray matter of the cortex.

Bacteriological examination of the eye showed diplococci both in cover slips and in sections through opaque vitreous. Vitreous was yellowish-gray, semi-solid at posterior part, purulent fluid escaping immediately on opening the eye. Sclera thickened and soft.

Microscope showed complete picture of abscess with degenerated, broken down cells in the center, and bacteria taking the stain better as periphery of the cavity was approached.

Optic nerve normal but dural sheath infiltrated.

INCOMPLETE PARALYSIS OF BOTH THIRD NERVES OF SUDDEN AND SIMULTANEOUS ONSET. COMPLETE RECOVERY.

By F. W. Marlow, M. D.,

SYRACUSE, N. Y.

W. H. Aged 17. Employed in casket works.

Seen first on September 19, 1892.

Previous history negative.

On waking on September 16th he found that he was unable to open his eyes, but later was able to do so in an imperfect manner. Double vision was noticed on the following day. There was no headache or vertigo.

Had to throw the head far back, and contract frontalis forcibly to see, and preferred to keep the left eye closed to avoid diplopia.

Examination showed:

R. Eye.—Almost complete ptosis; slight impairment of movements upward and inward. Extreme movements in all directions accompanied by nystagmus. Pupil normal, 3 mm. Acc. probably normal. Reads 1 J at 6 in.

L. Eye.—Ptosis a little more marked than on R. side. Movements upward and almost entirely lacking. Movement inward very defective, inner edge of cornea not reaching lachrymal papilla. Downward movement defective, but much less so than up and in movements.

R. dilated 5 to $5^1/_2$ mm., acts sluggishly to light. Acc. partly paralyzed, requires + 3 D. to read 1 J at 6 in.

There were no other symptoms.

September 21st. Ptosis decidedly less marked. R. up and in movements still slightly defective, and all movements from primary position accompanied by violent jerky nystagmus.

L. P. 3 mm., very little, if any, larger than R. Can read 1 J. at 6 in., but not as well as with R. All movements, except outward, very defective and accompanied by violent nystagmic jerks.

September 26th. Ptosis much diminished, range of movement increased. Nystagmus much less marked. Acc. seems to be completely restored. Diplopia continues.

September 30th. R. ptosis entirely gone. Movements normal, but accompanied by slight nystagmus upward and downward.

L. eyelid a little lower than R., movements up and in, still a little defective, and accompanied by nystagmus as in R. Sees singly all the while, but red glass over one eye produces crossed diplopia of varying degrees, the images sometimes being together.

Pupils convergence and accommodation normal.

It can scarcely be doubted that a vascular lesion, probably a hæmorrhage, occurred during the night of September 15th, involving the centers for the third nerve beneath the floor of the aqueduct of Sylvius, and was strictly limited to these centres and to certain portions of them: the centre for the left third nerve being involved to a greater extent than that for the right. That portion of the centres subserving downward movements being comparatively slightly involved, and that for the accommodation of the right eye escaping entirely.

The etiology is obscure.

TERTIARY ORBITAL PERIOSTITIS AND CELLULITIS WITH CONSECUTIVE UNILATERAL OPTIC ATROPHY.

By Wendell Reber, M. D.,

PHILADELPHIA, PA.

It is thought that the following case history illustrates a condition sufficiently infrequent to justify full report:

Case No. 182. Sept. 26th, 1891. A married female, aged 41, stated that when 30 years of age (11 years ago), she was infected by her husband. Three or four months after the suspected intercourse there appeared cutaneous syphilides, for which she was treated for over five months. Eight years later experiencing a renewal of the throat symptoms, she again sought a medical adviser who evidently saturated her with iodides, as she gives an accurate description of iodine blotches resulting from the treatment. Since then she has had no pronounced specific signs or symptoms. From the time of appearance of the secondary syphilides, her health has always been poor; a most natural result, however, for during all this period living in adultery she sowed to the flesh with all her might and main, having had no less than fifteen miscarriages, some spontaneous, the remainder induced. About three weeks ago (Sept. 15th, '91), the left upper eyelid began to swell and pain. The symptoms increased daily in intensity until September 26th, when I first saw her. At that time the upper lid was greatly swollen, tense, firm, and edematous near the inner canthus. There was great pain on pressure over the supraorbital notch, as also tenderness to pressure along the whole superior orbital margin. The upper lid was immovable, the eye bulged forward, ocular movements much embarrassed. Conjunctiva only slightly injected. Vision one-half of normal. The ophthalmoscope showed a little blurring of the disc edges and broad tortuous veins. Almost constant maddening headaches, nausea and vomiting. There is an anæsthetic region on the left side of the head, beginning about the anterior temporal zone and extending directly backward through a field two inches in width almost to the occiput. On the right side of the head is an hyperæsthetic patch occupying an almost identical area. On the lower limbs are three or four large copper colored tell-tale cicatrices. Patient was given a guarded prognosis as to vision. Treatment: Potass. iodid. gr. 25, three times a day, and increase 5 grains each day. Dry heat to eye. Hot baths daily.

Sept. 28th. Left eye better. Exophthalmus has quite disappeared, also conjunctival chemosis. No pain or vomiting. General condition much improved.

Sept. 29th. Left eye at a standstill. Today right eye looks threatening. Vision right eye, one-half of normal. Occasional lancinating ocular and orbital pains. Upper lid tumid. Ocular movements imperfectly executed. Conjunctiva hyperemic and somewhat chemotic. Ophthalmoscope shows nerve edges indistinctly, little if any swelling of the nerve fibres, no edema or signs of choked disc or papillitis. Ordered 7½ grains of acetanilid every two hours. Continue potass. iodid. three times a day.

Oct. 1st. Left eye almost normal. Fundus shows no lesion worth noting. Vision in the left eye one-half of normal. The right eye, however, is in a fulminant condition. The upper lid enorously swollen and edematous. The eye protrudes fully 5 m.m. beyond its normal plane. Stomach irritable. Acetanilid 10 grs. every hour. Continue the iodid. and heat to the eye.

Oct. 4th. R. E. Marked aggravation of all the symptoms. Terrific pain and tension all about the margin of the upper lid and orbit. Globe displaced slightly downward. Photophobia intense. Fundus could not be studied today owing to the extreme hyperæsthesia of the patient. The eye is absolutely immobile and cannot tolerate the slightest pressure. Almost constant vomiting of a cerebral character. Case seen today with a confrere who thought it well to add protiodid of mercury to the other treatment, and suggested antiseptic poultices instead of hot fomentations. Vision in right eye equals light preception only.

Oct. 7th. The inflammation in the right orbit has spent its force and is now subsiding. Eye quiet. The ophthalmoscope reveals some blurring of the upper, inner, and lower margins of the disc, with moderate venous congestion. Vision in the right eye, hand movements at 6 inches; left eye two-fifths of normal. Today began inunction of 20 per cent. oleate of mercury twice daily over the right eyebrow.

Oct. 10th. Very little ocular pain. Eye has receded into normal position. The tough, doughty infiltration of the lid is slowly resolving, as is also the chemois of the conjunctiva. Right eye performs slight lateral excursions today.

Oct. 17th. Marked amelioration of all symptoms. R. E. now performs moderate excursions in all meridians. Ophthalmoscope shows nerve head pale to temporal side and arteries somewhat diminished. Vision equals fingers at one foot. Taking now 45 grs. of potass. iodid. three times a day.

Oct. 24th. Today lateral excursions of R. E. perfect. Slight limitation of vertical movements. Anterior ocular segment normal. Pupil 3½ m.m. Vision equals fingers at two feet. Fundus examination shows disc growing pallid throughout; veins dark and full, arteries contracted, nerve margins clearly seen everywhere. Left eye presents normal vision and reads type O. 50 D. at from 12 to 24 inches.

Nov. 18th. Vision in R. E. remains fingers at two feet. As there is persistence of head pains, and as the iodides and tonics not only fail to promote the patient's general condition but are poorly tolerated, the patient was advised to visit the Hot Springs of Arkansas, in the hope that when all the excretory ways had been stimulated into their highest activity, she might be the more thoroughly iodinized. At the time of her departure, she was taking 60 grs. of potass. iodid. three times a day.

June 1st, 1892. Vision in right eye $^1/_{60}$ of normal (eccentric fixation). Patient was wonderfully benefited by her trip to the Springs. She is looking rotund and rosy. Says she feels a sense of vigor that has not been hers for 15 years. Ophthalmoscope today as follows: Media clear, pupil 6 m.m., disc round, pearly white, edges everywhere sharply defined, adjacent choroid and retina show no signs of previous inflammation, arteries thread-like, veins of fair size, but rather wavy, disc shallowy excavated, macula normal. There is today noticeable for the first time, a slight ptosis of the right upper lid. All the other ocular muscles function perfectly. The left eye presents no abnormality. The anæsthetic and hyperæsthetic patches in the scalp have disappeared.

The interesting features in connection with this case are:

1. The precipitate onset of the trouble in the right eye at a time when the patient was under antisyphilitic treatment.
2. The rapid subsidence of the trouble in the right orbit.
3. The optic atrophy in the right eye as a result of stretching.
4. The striking effect of treatment at the Springs on the patient's general condition.

The cellulitis and periostitis were three weeks in reaching a crisis in the left orbit, while but five days elapsed from the time of onset to the development of the most threatening stage in the right orbit, and that, too, in the face of most vigorous specific medication.

The rapid disappearance of the orbital symptoms under iodine saturation is perhaps noteworthy, for of all varieties of syphilis, gummatous or other specific inflammation of the orbit is held to be the most obstinate to treatment.

Unluckily, the conditions in the right orbit could not be controlled in time to preserve the functions of the optic nerve. Whether the subsequent atrophy was due to pressure of the orbital contents on the delicate optic nerve tissue, or whether it was due to the long continued stretching of the nerve that must have accompanied such marked exophthalmus, is difficult to decide. I incline to the belief that the latter element is chiefly answerable for the optic atrophy.

In conclusion I would like to draw attention to the marked improvement in the patient's general condition wrought by her stay at the Springs. This is one of three instances I have seen in which intoleration to all medicines while the patient remained at home, passed over into the most generous toleration of the extremest measures when the patient was brought under the health giving influence of a wisely supervised life (under the direction of a physician) at some one of the hot springs in which our country abounds. Without this aid I believe this patient would have soon sunk into the miseries of a tertiary syphilitic cachexia from which there could have been little hope of her rescue.

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ABSTRACTS FROM CURRENT SPANISH LITERATURE.

By Dr. Albert B. Hale.,

CHICAGO.

Treatment of Cataract in Glaucomatous Eyes.—Evisceration of the Eyeball.—Iritis Blennorrhagia.—Therapeutics of Eye Diseases.—Total Infiltration of the Cornea with Re-Establishment of Transparency.

Treatment of Cataract in Glaucomatous Eyes.

Dr. Francisco Ti. y. Suner, in the *Revista de Ciencias Medicas* (Nov. 25, 1896), has a note covering the treatment of cataract in eyes suffering from chronic glaucoma. Glaucoma limits the periphery of the visual field, and a cataract affects the center. Thus the eye is losing in usefulness in two directions, and the author would deprecate an inactive policy under such circumstances; but, as he does not believe in extraction of the lens, he would always perform an iridectomy. even before the lens is ready for an operation. Another reason for the iridectomy lies in the fact that by this means the glaucoma is best retarded, as iridectomy is always of service in any condition. A. B. H.

Eviseration of the Eyeball and Mules' Operation

are compared by Dr. Rodolfo del Castillo (*El Siglo Medico*. Madrid, No. 2242, Dec. 13, 1896). He takes a strong ground in opposition to Beckerton (Liverpool), who praised Mules' operation so highly at the last meeting of the British Medical Society. Castillo much prefers the operation of Bonet of Lyon (Evisceration), which leaves the substance in the orbit to support the artificial eye and yet introduces no foreign body. In analyzing cases of evisceration Castillo finds that sarcoma plays an important part—atrophy is also one of the causes for the operation; thus, many cases are unsuitable for Mules' operation on account of the difference in size of orbital contents. Consequently only leucomatous eyes are really adapted to it, and surgeons should therefore be conservative in abandoning the safe and oftener indicated method. A. B. H.

Iritis Blennorrhagia.

DR. RODLFO DEL CASTILLO reports (*Revista de Medicina y. Cirurgia Practicos*, No. 521, 15 Feby., 1897) two cases of iritis blennorrhagia traceable directly to the gonococcus of Neisser, both by admitted history and by demonstration.

The first case, a boy of sixteen, had attended the clinic on account of pain in the right scapulo-humeral articulation. The patient acknowledged gonorrhœa about four weeks previously which had subsided with the exception of the morning drop. Ten days after the articular pain he returned, this time coming to the eye clinic with a well developed iritis serosa. As no other cause could be found the guilt was laid to the gonorrhœa. Treatment resulted in a cure.

The second case, a young man of twenty-two, was in the surgical ward for an infected wound of the hand. While there iritis developed with no exciting cause bebeyond a confessed history of gonorrhœa two months ago. A. B. H.

Therapeutics of Eye Diseases.

DR. J. SANTOS FERNANDEZ, in reviewing the Nouvelles Formules d'Oculistique of Bourgon (*Cronica Medica de Habana*, No. 24, Dec. '96), calls attention to the startling changes made in the treatment of some eye diseases, and to the tendency to return to the older methods of treatment in others. Sudden changes are not uncommon and ophthalmology must keep abreast of allied sciences, bu the deprecates the habit of calling a treatment new, merely because it has been recently resorted to—the literature must be well studied before any method can be called new. Many drus, such as peonia abrus precatorius, suggested by Fernandez in 1884, are called new because but recently brought to life again, but he thinks the credit to it belongs to him instead of to Bourgon or the French school.

A. B. H.

Total Infiltration of the Cornea with Re-Establishment of Transparency.

Two cases are reported by DR. J. SANTOS FERNANDEZ of Havana (*Chronica Medico-Quirurgica de la Habana*, No. 2, Jan., '97).

Case I. was a child of 5 years, suffering from suppurative ophthalmia for twelve days. The conjunctivæ were swollen, bathed in pus, and the corneæ were completely opacified (white) by infiltration, although the epithelium remained intact. A hopeless prognosis for vision was given, but after a few days of treatment (permanganate of potash wash and frequent use of silver nitrate 2:100) improvement set in and the corneæ cleared. Twelve years after there was only the faintest cloud on the right eye.

Case II. A child of 17 days with typical ophthalmia neonatorum. Both corneæ were totally opaque, but the epithelium uninjured. The above treatment conquered the inflammation, and the corneæ gradually cleared so that 15 years afterward all that could be seen was a capsular cataract on the left eye.

The author can give no explanation of these fortunate results. Neither compression bandage nor other treatment can account for it, because the children were both rebellious and refused bandages or to be treated except by force. Fernandez can only guess that the intactness of the epithelium prevented the cornea from being invaded by pathogenic micro-organisms, and that the infiltration was not of so poisonous a nature as to prohibit nearly complete absorption after the inflammatory irritation had passed. A. B. H.

ABSTRACTS FROM RECENT GERMAN OPHTHALMIC LITERATURE.

Quarter Ending April 1st, 1897.

By H. V. Würdemann, M. D.,

OF

MILWAUKEE.

Coloboma of the Retina without Fissure of the Choroid.—Ocular Disease from Gout.—Pathologic Anatomy of Pyramidal Cataract with Anterior Synechia.—Colored and Colorless Spectacles.—Pathology of Ectropion Sarcomatosum.—A Rare Case of Keratitis Parenchymatosa.—Contribution on Ptosis.—Correction of Irregular Corneal Astigmatism with Lenses.—A Case of Cataract Probably Caused by Entozoa.—Two Cystircerci in the Same Eye.—A Fiber Attached to the Retina.—Changes of the Lens Due to Traction of the Zonula. Röntgen Rays in Ophtnalmology.—The Medical and Operative Treatment of Myopia and Its Complications.—Conjunctival Flaps in Wounds of the Ciliary Region.—Paralysis of Convergence.—Cataract Discission.—Enucleation and Exenteration.—Primary Syphilis of the Conjunctiva.—Psychic Disturbances Following Ocular Injuries.—Ichthyol in Ophthalmology.—The Usefulness of the Visual Field in General Diagnosis.—The Therapeutic Effect of Raw Petroleum for Conjunctivitis.—The Importance of Magnan's Symptom in Chronic Cocain Poisoning.—Relation Between the Eye and Ear in Pathologic Conditions.—Wandering Cells in the Cornea.

Coloboma of the Retina without Fissure of the Choroid.

Hosch, Fr., Basel. (*Arch. f. Augenhkde.*, Dec. 9, 1896.) Nineteen cases have been reported by different observers. H. has recently had oppportunity to closely observe an anemic myope of 18 years, female. No other anomalies were demonstrable. Parents not related, nor myopic. Externally the eyes appeared normal. R. E. counts fingers at 2 to 3 m. with — 5. D. Jaeger 16 at 8 c.m. L. E. V, 6/X with —2.50 D. Jaeger 1 at 11 cm. Central color sense and visual field for form normal.

The blind spot was slightly increased. Media clear and no anomaly of the uveal tract. In the R. E. the disc was very sharply outlined and its diameter increased 2 to 3 times. Around it, and separated from it by a black ring, was a glittering, yellowish, white ring external to which was an irregular, interrupted ring of black spots of various shapes. Above and below this gradually shaded into the normal red fundus so that the white figure appeared four-cornered. Pigment epithelium seemed to be almost entirely wanting in the whitish portion of the figure.

The papilla had the appearance of a kettle-shaped excavation with over-hanging edges. The center of this was grayish-red and presented none of the stippling of the lamina cribosa of the normal disc. Ten to twelve small vessels rose from the depth of the excavation and turned at a sharp angle over its edge. The fundus of the left eye presented the same appearance, except that the papilla was larger and quite as regular. There were no traces of retino-choroiditis in either eye. H. thinks this a case of coloboma and not one simply of physiologic excavation of the optic disc.

There are two theories of the development of retinal coloboma. That of Ammon and Manz provides that it is due to a failure in fœtal development. The primordial ocular folds, which normally unite at the 7th week of intrauterine life, fail to completely close at the termination of the optic nerve. This view is confirmed by the fact that coloboma of the disc usually extends downward. In the case of H. the appearance and color of the disc and normal tension of the eye would substantiate the view of congenital non-development and the belief that the excavation was anatomic and not caused by pressure.

The theory of Deutschmann premises that the appearance of the fundus is due to intrauterine choroiditis in which the fœtal ocular folds are concerned only so far as they present a locus minoris resistentiæ. It may select the part of the choroid just below the papilla as a "point of selection," in the same way that iritis attacks with preference the lower part of the iris, retinitis pigmentosa the periphery of the retina, or tuberculosis the apices of the lungs. H. V. W.

Ocular Disease from Gout.

WAGENMANN, A. JENA. (*Arch. of Ophthal.*, Jan., 1897.) It has but lately been realized that true gout may cause ocular disease. Instances are more frequent in England and France.

The gouty diathesis, whether the symptoms be typical or atypical, must be demonstrable in order to make the diagnosis. The familiar involvement of the metatarsophalangeal joint of the great toe, changes in other joints, disturbances of the digestive tract, muscles, organs of respiration, circulatory or nervous system, or gouty cachexia may be present. Neuralgia, lumbago, spasm of the calves, early atheroma of the vessels, migrain, eczema, etc., may occur and are of diagnostic value. Urinalysis reveals free uric acid and excess of urates. The tissues of the eye which are most liable to be involved are the choroid and sclera, but the following may also occur: Lithiasis and eczema of the lids, keratitis senilis as a form of peripheral corneal opacity or a circulus seniles, scleritis, iritis distinguished by a great tendency to hemorrhage and excessive painfulness, choroiditis, cylicitis, retinitis, retinochoroiditis,cataract, particularly presenile glaucoma,thrombosis of the retinal vessels, migrain with visual disturbances and paralysis of the ocular muscles. The decidedly favorable effect upon glaucoma of antiarthritic treatment in these cases is striking. Often the glaucomatous process increases despite eserin and accurate correction of refraction for distance and near, until an inflammatory outbreak transpires and the symptoms subside only when general treatment of the gouty diathesis is resorted to systematically. Gout may predispose to glaucoma by causing certain vascular changes. producing a tendency to inflammation in the arterial tunics and endothelium and by inducing rigidity of the sclera. H. V. W.

Pathologic Anatomy of Pyramidal Cataract with Anterior Synechia.

HARING, WIHL., Ostrau. (*Arch. f. Ophthal.*, Jan., 1897.) By pyramidal cataract is understood a conical projection upon the anterior surface of the lens into the anterior chamber. It may touch the cornea and may be congenital or acquired. It is not infrequently due to a perforating corneal ulcer. In such cases the process of development is as follows: With the loss of the aqueous, the lens is brought into contact with the cornea with which it forms firm adhesions. When the fistula closes and the chamber reforms, steady pressure generally separates the lens and cornea, drawing out the agglutinated tissues into a conical mass extending between the cornea and lens.

Congenital cataract may be caused in very early stage of embryonal development, when there is no anterior chamber, by disease of the cornea causing adhesion between it and the anterior capsule of the lens. It can be caused only by corneal perforation in the lattter stages of intrauterine life after the anterior chamber has formed.

The anatomico-pathologic changes of pyramidal cataract differ very little from those of anterior capsular cataract, in which the capsular cells are principally concerned. According to Müller a homogenous, fibrinous, intercellular substance is demonstrable. This causes an opaque nodule often as large as a barley grain. Careful examination has failed to show the presence of any element foreign to the tissues concerned. According to Wedl, Becker and Singer, in pyramidal cataract the adventitious tissue is largely epithelial. The part adjacent to vascular edges of corneal ulcers showed hypertrophy and proliferation of the epithelial structures with an abundant outwandering of round cells with round neuclei. Some of these leucocytes had an oval form, with nuclei also oval.

Stoeber reports a case of pyramidal cataract in which the lens was not opaque. A conical whitish mass extended from the lens to the cornea. There was a central opacity of the cornea. The anterior chamber was normal. The lens was removed after severing its connection with the cornea. No diffculty was experienced. The histologic finding agrees with Müller's and Singer's.

Collins believes the first change in these cases to be a proliferation of epithelium. Old cases show a cellular layer separating the opaque mass from the normal lenticular substance. In two cases a hyaline sheath was found combined with the cellular layer. Cases are also reported by Mules, Schirmer, Ayres and Kreichow.

H. minutely describes a case of pyramidal cataract which appeared clinically as a yellowish cone projecting into the anterior chamber from the lens. Anatomic investigation showed that this was adherent to the cornea and was undoubtedly connected ethologically with a corneal perforation in childhood. A cicatrix and traces of ruptured Descemet's membrane marked the site of perforation. The anterior capsule was projected forward in a nodular form with proliferation of capsular epithelium within it.

The capsule was thinner over the pyramid than elsewhere. This is thought to be due less to stretching and expansion than to lack of physiologic growth, for the usual uniform epithelial layer was very irregular. This case was peculiar in that the pyramid consisted partly of connective tissue, partly of hyalin substance, neither of which was present in the lens. In the center of the conical projection was connective tissue and around this was a thick sheath of hyalin substance. The former probably developed from the corneal cicatrix which was vascular, and the latter from Descemet's membrane, a unique occurrence. Wagenmann describes a case in which a thickened sheath of hyalin and fibrous tissue extended from Descemet's membrane over the pyramid to the anterior capsule, over which it spread to the pupillary margin. Besides the pathologic changes given, others are observed with occlusions of the drainage angle, secondary glaucoma, ectasia bulbi, increased intra-ocular tension and atrophy of the entire anterior section of the eye. Owing to the early age the ocular tunics are very elastic and the eye increased in size. After atrophy of the ciliary body the ocular equlibrum is partially restored. H. V. W.

Colored and Colorless Spectacles.

PERGENS, ED., Brussels, (*Klin. Monatsbl. f. Augenhkde.*, Feb., 1897.) contributes an interesting article, of which the following is an abridged translation.

I. Historical. It is impossible to say when colored eye glasses were first used, but it is certain that Nero observed the combats of his gladiators through concave smaragdines, or emerald glasses. In the 13th century we first find definite accounts of the use of colored coquilles. They are mentioned by Fra Giordano de Rivalta. Salvinus Armatus, Bacon, Gordonius and Guido a Cauliaco. Parè, in the 16th century, mentions a ring of horn with a hole in the center which was used before each eye. Guillemeau mentions them, but gives nothing more definite. Bartisch in the last quarter of the 16th century would have nothing to do with glasses, because he could not understand how any one could see better with something in front of the eye to look through than when vision was unimpeded. He gave a variety of powders, pills, eye-waters and amulets for all diseases of the eye. If the "crystaline humor or vitreous'' were not clear, Bartisch thought glasses might improve vision. Falko reports finding green glasses in a patriarchal mausoleum of the 17th century. Later eye physicians used glasses more, but with very curious ideas as to their usefulness. Saint Yves (1722) speaks of white and green plain glasses with a decided preference for the latter. Guerin (1769) speaks of people who carried concave lenses hidden in their hat or secreted about the person for use in emergencies. Deshais Gendron (1770) recommends green and yellow glasses, since these colors cut off the red rays which are irritating. Green, yellow and blue convex and concave glasses were not to be used since they were harmful to the eyes. Desmonceaux (1786) discusses green, yellow and blue glasses, but condemns their use. He speaks of the wide spread abuse of the monocle in his time. London smoked glasses come into use in the first half of the 19th century. Boehm (1862) speaks very favorably of the use of blue glasses in a variety of affections of the eye. Blue light, according to Boehm, is more refrangible, beautiful, pleasant and transmissible than other light. Red light, says Boehm, is very irritating, and speaks of the irritating effect of bright red upon the turkey gobbler and bull. In 1870 Calderini examined spectroscopically gas and petroleum light and found a great preponderance of red, orange, yellow and green. He thought that yellow especially was most irritating to the retina. To rest the eye, he proposed gray glasses in preference to blue, because blue is the complimentary color of yellow. Dobrowolsky (1873) speaks in favor of the triple theory of colors. He believed that one nerve transmitted sensations of red, another of yellow and another of blue. He recommended smoked glasses as being best for the retina. Chevalier thought red and yellow most harmful to the eye, and very warmly recommended blue-black glasses. Blue, smoked and uranium glasses were useless. Magnus (1875) recommended gray glasses and maintained that they did not reduce the visual acuity. How this is possible cannot be understood. He condemned blue glasses since they reduced vision. Fieuzal (1887) preferred the yellow glasses which bear his name. They consist of yellowish glasses with a tinge of blue slightly smoked. These were supposed to exclude red, cyanogen blue and violet rays. He based his views upon the discovery of van Genderen Stort of the contraction of the cones under the influence of light. Later research shows that the cones contract most strongly under the influence of green light. Fieuzal found that yellow light did not cause contraction.

In 1895, I made experiments in absolute darkness and obtained decidedly greater lengthening of the cones than van Geuderen Stort. In 1896 I experimented with spectral illumination and got distinct contraction of the cones with yellow light. New glasses of greenish blue, or called slate tint, have just appeared in Paris.

II. Changes in the retina produced by light. According to Franz (1876) the visual red is destroyed by light and the pigment descends toward the limitans externa. The following light reactions of the retina are recognized:

1. Pigmentary migration.
2. Changes in the visual red and visual purple.
3. Contraction of the rods and cones.
4. Diminution of the nuclein.
5. Changes in the nervous protoplasm.

The changes in the pigment produced by colored light have been especially studied by Boll, Kuehne and Angelucci. Kottgen's observation that light from the blue sky and sunlight cause a variation from 18 to 61, fully threefold, is very interesting. In my investigations I used Auer's gas light, which after 24 hours steady burning, remained constant. Thus I was sure of a uniform source of light.

In studying the action of spectrally decomposed light it is found that the visual purple is bleached to visual yellow most intensely by yellow and green. The visual yellow is bleached to white most intensely by violet. The contraction of the cones is most intense in green. The diminution of nuclein is most intense in red. In blue light the contraction of the cones and the nuclear and pigmentary changes are least, hence monochromatic blue light is most commendable in cases where rest for the retina is indicated. The fact that the contraction of the cones is least in blue and increases through yellow to red and is most intense in green agrees with the parimetric findings.

III. Colored glasses. In studying the peculiarities of colored glasses nearly all of the large manufacturers in Europe were communicated with. In all, 300 different shades and tints were secured. The so-called neutral or smoked glasses are a mixture of glass with oxide of manganese, cobalt, iron and copper. These glasses do not possess the desired absorption co-efficient. In some yellow, in others red, blue or green predominated. Smoked glasses of iridium sesquioxid were somewhat better. Red glasses were usually colored with copper oxydulate. More expensive varieties were tinged with Cassius purple and mixture of oxides of tin and gold. Yellow glasses contained potassium antimoniate. Others contained chloride sulphate or borate of silver.

Upon testing the best smoked glasses with Auer's gaslight it was found that the light was equally dimmed, but looking at blue sky with white clouds other tints appeared. In a deeper shade of smoked glass a light reddish color was visible. It was. evident that smoked glasses absorbed red light least, and as red light is most irritating to the retina, smoked glasses are not commendable to afford rest to it. Blue No. 4 transmitted only white light which appeared uniformly bluish. Spectrascopically it transmitted red, blue and violet. I have a dark blue greenish glass which in direct sun light transmits light from green to violet only, with no trace of red. This seems to possess the desired quality. And it is of course very injudicious to suppose that much light should be admitted to a retina which requires rest.

IV. The measurement of colored glasses. That every manufacturer of spectacles has a scale for smoked and blue glasses is well known. They are always arbitrary and do not coincide. In an earlier article I proposed as a unit of comparison for smoked glasses a shade which transmits no light from a Hefner amyl acetate light removed 1 m. The light intensity is inversely proportionate to the distance of removal. Thus, at 0.5 the intensity is 4 times as great as at 1 m. At 0.25 m. 16 times as great. The nearer the eye is to the source of light the greater any error appears, and vice versa. In order to accurately estimate the co-efficient of absorption the smoked glass should be as near to the eye as possible. The same is true of other kinds of colored glass.

V. The preparation of colored glasses. In plain or parascopic glass only is the color uniform; in lenses convex or concave the tint varies in different parts of the lens according to its thickness. It is possible, by taking plain colored glass and cementing on one side a planoconvex or concave lens and on the other a plano-cylinder, to secure any desired refraction without any variation in the shade. In order to secure uniformity in smoked glasses a smoked glass of 1 m.m. thickness should absorb 0.1 of the Hefner light at 1 m., and a glass of 5 mm. thickness should absorb as much as 5 such plates superimposed.

VI. Colorless glasses. These may be of glass or of rock crystal. The only advantage of the latter is that they are less easily scratched. Glass absorbs much more ultra-violet light than rock crystal, and hence is commendable for cataract glasses where the crystaline lens, which naturally absorbs these rays, is absent. H. V. W.

Pathology of Ectropion Sarcomatosum.

Rumschewitsch, K. (*Klin. Mon. f. Augenhkde*, Jan., 1897.) In ectropion of the lower lid there is swelling of the conjunctiva. with hypertrophy of the adenoid tissue along the orbital margin of the tarsel cartilage. Disease of Krause's glands is not the most important factor in ectropion of the lower lid, contrary to the teaching of Wolfring. These glanas are of relatively insignificant size in the lower lid and have nothing in common with hypertrophy and cellular infiltration of the adenoid tissue along the ducts of these glands. H. V. W.

A Rare Case of Keratitis Parenchymatosa.

Stern, E. (*Klin. Mon. f. Augenhkde*, Jan., 1897.) Patient, a girl of 18. No specific history was obtainable, and there was no symptom indicating syphilis, hereditary or acquired. After a re-vaccination 6 years previously she began to suffer with urticaria hemorrhagica. Numerous ecchymoses were visible in different parts of the body, including the eye. Yellowish infiltrations occurred in sclera near the upper margin of either cornea, and from these minute hemorrhages spread by continuity into the corneal tissue. Retinal hemorrhages were present. S. thinks the etiology of the keratitis is connected with the urticaria. The cornea was cloudy, injected and contained some small blood vessels. Three months' treatment served to remove the corneal disease. H. V. W.

Contribution on Ptosis.

V. Kempner, (*Klin. Mon. f. Augenhkde*. Jan., 1897.) reports a case of ptosis from peripheral paralysis of the levator palpebrarum of traumatic origin and of 25 years, duration. He operated according to the method which has been so thoroughly elaborated by Binbacher. Careful attention was given to the proper execution of every detail, and as a result he is able to report that the condition of the patient is permanently improved. H. V. W.

Correction of Irregular Corneal Astigmatism with Lenses.

LOHNSTEIN, TH. (*Klin. Mon. f. Augenhkde*, Dec., 1896.), discusses this problem, applying it with particular reference to his own eyes, which were extremely myopic and astigmatic. He cites the proposal of Raehlmann for kerato-conus. to use a hyperbolic glass, and that of Fick to use a contact glass, but has not been able to trace any practical use from them.

Operation (A. v. Graefe, E. Meyer, Schweigger,) praised by some, discarded by others, was tried by the reporter himself (galvano-cautery) without success. The anterior chamber was once, by accident, emptied of the aqueous, when visual acuity increased wonderfully, only to sink again after the wound had healed.

Lohnstein, therefore, determined to try the effect of an apparatus constructed on Thomas Young's theory that the corneal action could be neutralized by a properly shaped vessel filled with watery solution of the same refractive index. Two problems presented themselves: (1) To find such a properly constructed apparatus to place before the eye. (2) To test the eye's tolerance of such a foreign body. An apparatus was found which could be borne for hours without inconvenience. The physiological salt solution was at first adopted, but the author finally resorted to an 0.85 per cent. solution, as the least irritating and the most comfortable to the conditions of refraction as well as of tissue requirements.

Vision, which in the right eye (—5.00) had been improved only to $\frac{1}{8}$ for distance, and to the occasional $\frac{1}{2}$ for near, was raised by the contrivance to $\frac{2}{3}$, and by using a diaphragm of 3.5 m.m., V. $\frac{2}{11}$ could be obtained and maintained. Some days the apparatus was used seven hours, altogether, often for an hour and a half at a time. In the left eye (emmetropic, but with kerato-conus that admitted of only $\frac{1}{18}$ of the normal vision) improvement was marked, V. $\frac{1}{2}$ or $\frac{2}{3}$ being obtained, although for the near, this eye was useless.

Lohnstein calls his apparatus a hydrodiascope, and admits that the principle is the same as that of Fick's "contact glass," but thinks the former much more comfortable. A. B. H.

A Case of Cataract in a Boy of 14, Probably Caused by Entozoa.

HENNICKE (*Klin. Mon. f. Augenhkde*, Dec., 1896.) reports a case of a boy of 14, who complained that his left eye had become blind during the last three weeks. On examination vision was found to be reduced to counting fingers at ½ m. (O. D. V. 1. with M. 1.75 D.), with a contracted field of vision. No cause like trauma could be ascertained, but the boy had some time ago suffered from worms (oxyuris). The diagnosis was cataract, and removal was decided upon. During the operation, unfortunately, the lens was lost, so no corroboration could be offered. Vision and field were restored. A. B. H.

Two Cysticerci in the Same Eye.

PERGENS, ED., Brussels (*Klin. Mon. f. Augenhkde*, Dec., 1896.), publishes the history of a dressmaker 21 years old. who had for some time complained of failing vision in the left eye. V equalled finger counting at 3 meters only in the upper and lower quadrants of the field; temporal and nasal quadrants were quite blind. There was no pain. With the ophthalmoscope a typical cysticercus vesicle with a long scolex free in the vitreous was easily seen at the right side of the papilla. Evidently was a Taenia inermis. Left of the papilla there was a suspicious vesicular protuberance of the retina, which, two days later, had really pushed its way through the retina and showed itself as a second scolex. Operation was refused, and subconjunctival sublimate injections were tried: they seemed rather to stimulate the animals, and the treatment was abandoned. The eye itself was painless, iris and accommodation seeming unaffected. The patient was otherwise well. The source of the parasites was probably green vegetables, water and raw meat, although infection had not taken place elsewhere. The animals continued to grow until they finally usurped the whole eyeball, and were lost to view through cloudiness of the media. V finally sank to O. The reporter thinks this is the third reported case of double cysticercus. One case is cited from Otto Becker in Mauthner's *Lehrbuch der Ophthalmoscopie*, p. 468. The second from A. Graefe, *Klin. Monatsbl.*, XXX. p. 297. Schoebl (*Centralbl. f. Augen.*, XXII. p. 101,) reports a case of triple cysticercus, and others have been discovered, *post-mortem*, in human beings and pigs. A. B. H.

A Fiber Attached to the Retina.

CASPAR, Muelheima, Rh. (*Klin. Monatsbl. f. Augenh.*, Dec., 1896), describes a case in a metal worker 26 years old. who had been three years ago attacked by plastic iritis in the right eye, the cause being probably an injury. The eye recovered and gave no pain, but was observed incidentally when the left eye was injured by a foreign body. The appearance was as follows: Pupil of normal movement, but from the edge of the iris above there hung downward a 5 to 6 m.m. brown thread, like a bed-cord; this fiber sprung from the uveal pigment, was freely movable in the papillary area and ended in a knob-like enlargement. When quiet it rested against the anterior lens surface, but the free end could be made to float against the cornea. A second and darker thread crossed the iris in its inner and lower quadrant, but was attached at both ends. There was no synechia; V $\frac{5}{18}$. The fibers were undoubtedly formed from the uveal pigment. A. B. H.

Changes of the Lens Due to Traction of the Zonula.

STADFELDT, Copenhagen (*Klin. Monatsbl. f. Augenh.*, Dec., 1896,) gives a digest of some of his work on lenses removed with the suspensory ligament from the cadaver, and uses his results to support Tscherning's theory of accommodation.

In the first place he measured eleven human lenses (in the living eye) with the Tscherning ophthalmophakometer, obtaining a mean radius of the anterior lens surface of 10.5 m.m. The same radius, in six relaxed lenses taken from the cadaver, showed a dimension of 11.4 m.m. This favors the Tscherning theory, unless it is assumed that the lens loses its retractible power after death. That this is not so, was shown by a second experiment, in which the human lens was removed from the cadaver, with the zonula, fastened to a ring of cork by pins gave to some of the meridians unequal tension. By using a candle flame at a good distance and studying the image formed through the lens by the microscope, it was seen that the lens was astigmatic, that is, that the image was distorted in one meridian. The meridians were then marked, and also determined by the ophthalmometer, and found to correspond to the distortions of the image, the radii being different according as the anterior or posterior surface was measured. The pins were then removed in that meridian showing the greatest refraction, and the measurements again made; the astigmatism had nearly disappeared. The auhtor takes this as a proof that relaxation of the zonula effected an increase in the radius. The results of the experiments are presented in the following table: R. 1, radius of anterior surface; R. 2, of posterior surface:

		Focal Distance.	R. 1.	R. 2.	R. 1.	R. 2.	
O.D	1st Meridian	59.1 m.m.	11.5 m.m.	6.4 m.m.	11.5 m.m.	6.4 m.m.	After relaxation of 2d meridian-
	2d Meridian.	55.2 m m.	10.2 m.m	6.4 m.m.	11.5 m.m.	6.4 m.m.	
O.S	1st Meridian	60.4 m.m.	11 3 m.m.	6.7 m.m.	11.3 m.m.	6.7 m.m.	
	2d Meridian.	57.6 m.m.	9.9 m.m.	6.7 m.m.	10.3 m.m,	6-7 m,m.	

A. B. H.

Röntgen Rays in Ophthalmology.

Lewkowitsch, H., London (*Centralbl. f. prak. Augen.*, January, 1897).

X-rays are being used widely by surgeons for diagnosis in locating foreign bodies in the tissues, but hitherto this agent has been very little used for this purpose in ophthalmology. This fact would be much more significant if we were in a position to use X-rays in diagnosing foreign bodies in the eye, particularly when the same cannot be located with the ophthalmoscope. In this category would be: (*a*) When the intruder is of minimum size; (*b*) when it is imbedded in the opaque tissues of the eye; (*c*) when extensive extravasation of blood has occurred; (*d*) when the cornea is not translucent. In these critical cases the electro-magnet sometimes does excellent service in removing these objects when metallic, but may fail at a very important juncture. It is much less useful in locating them. The perfection of Prof. Hirschberg's operative methods for removing iron fragments made a great stride forward in the treatment of these case. A great number of cases are now thought operable, and a relatively larger percentage of cases result favorably. It is to be regretted that there is often no definite landmark to guide the operator. Often he cannot know where, how deep. nor in what direction to cut. This seriously limits operative procedures, and may prevent the successful use of the electro-magnet. The latter, of course, has no influence upon fragments of glass, and literature affords reports of many cases of enucleation because they were hidden from the ophthalmoscope.

These considerations have induced L. to make a series of experiments with the object of rendering X-rays useful in these cases. He is not prepared to publish in full his methods yet, but wishes first to get entirely beyond the theoretic and experimental stages. The anatomic situation of the eye makes the use of X-rays very difficult. The first thing to be determined was just where to place the sensitive plate in order to get as clear and extensive a skiagram as possible.

First Experiment.—A fine needle was thrust into an enucleated sheep's eye and placed under a Crooke's tube for the proper time and at the right distance, then, without moving the eye or plate, the tube was moved a few inches and the exposure repeated for the proper period. Thus a double image of the needle was secured. This method was found extremely useful in locating the foreign body, and by careful calculation it can be done exactly. The use of two tubes simultaneously was tried, but yielded less satisfactory results than the method given.

Second Experiment.—An enucleated sheep's eye was placed in a metal tube so that the cornea projected in a manner analogous to its position in situ. The tube, impenetrable to X-rays, represented the bony walls of the orbit. The sensatized plate was placed in contact with the tube, parallel to its long axis, and projecting two inches beyond the cornea. This is tentatively designated the "nasal position," and corresponds to the position occupied by the plate when the eye is in situ, *i. e.*,against the nose at the inner angle of the eye. On the side of the metal tube opposite to the plate the vacuum tube is placed at a distance of 6 to 7 inches. A picture is made of as much of the projecting eye as possible. In order to get a shadow of more than the anterior segment in situ it is only necessary to have the patient strongly rotate the eye in and out.

In order to exactly locate a foreign body a landmark is necessary, from which precise measurements can be made in each of three planes, vertical, horizontal and sagittal. For this purpose a little indicator with three arms, one for each plane, was constructed. This was placed opposite the center of the pupil, almost touching the cornea and parallel with the sensatized plate. Glass was found to be better material for the indicator than metal on account being non-conductive. Another accessory was the arrow which was attached to the frame of the plate, pointed upward and was called the pole-indicator. Guided by the arrow the plate can be moved a given distance, returned to its original position, and, what is very important, exact measurements can be taken from it afterward in estimating the location of the foreign body. With these provisions the point of a fine needle, 2 m.m. long, was thrust into the sheep's eye 9 m.m. from the limbus corneæ and an exposure was made for one minute, the Crooke's tube was then shifted upward in the sagittal plane parallel to the sensitive plate.

In order to prove their applicability to the living subject L., now for lack of a patient, used his own eyes. A metal disk 2 m.m. in diameter was made to adhere to the cocainized conjunctiva bulbi. The fact that the foreign body was external to and not imbeded in the tissues of the eye does not detract from the validity of the experiment. After making several attempts L. found that by cutting one side of the sensatized plate into a semi-circle it could be pushed deeper into the orbit between the bulbi and os lachrymalæ and a much larger skiagram secured. Then only was he able to succeed in getting the shadow of the disc in his eye. With the foreign body 12 m.m. from the external margin of the cornea he secured plain double images, both when the eye was strongly adducted and abducted. By comparing the relative distances between the foreign body and the indicator in the first and second shadows, and in adduction and abduction, it was possible to determine whether the foreign body was on the nasal or temporal side, a thing otherwise impossible. The foreign body can be located within 1 m.m. by estimating the distances between the shadows and the plate. H. V. W.

The Medical and Operative Treatment of Myopia and Its Complications.

MOOREN, ALBERT. (*Centralbl. f. prak. Augenhkde.*, Jan., 1897.) His statements are based upon observations covering 150,000 cases.

In the first chapter the occurrence and observation of myopia are discussed. Much space is devoted to the influence of disturbances of accommodation upon the refraction. How myopia is produced by ciliary spasm is shown. Usually the methodic use of atropin removes this. If it does not, increased antero-posterior axial diameter exists. A myope cannot accommodate sharply without straining his interni in order to converge and fix the object at the abbreviated distance at which it is visible. Exhaustion of the interni follows. Excessive effort at convergence induces increased accommodation. Thus a circulus vitiosus is kept up which may be disastrous, may end in lenses, prisms, or tenotomies.

The circulatory disturbances caused by ciliary spasm tend to cause gradual softening of the tissues of the fundus and progressive lengthening of the antero-posterior axis. The distensibility of the sclera is limited, and there may be reaction causing elevated intra-ocular tension. M. states that wearing fully correcting lenses for the near is exceedingly pernicious and condemnable because they require exercise of the accommodative faculty, induce ciliary spasm, intensify the refractive error and cause progressive myopia *(sic!)*. There is danger of detachment of the retina and slow inflammatory changes.

In the following section the author describes his first attempts at the operative treatment of myopia by discission. When he published the results he met the determined opposition of v. Graefe and Donders. His experience with the discission needle was gloomy. He substituted iridectomy and capsule laceration with v. Graefe's small cataract knife, followed by non-instrumental trituration. This "artificial cataract ripening" proved devoid of danger. In 149 cases of bilateral operations only one eye sustained fortuitous complications. The contra-indications are astheromatous arterial degeneration, antero-capillary fibrosis, etc.

The operation is done under cocain. The capsule is split throughout its whole extent with a small v. Graefe knife. The lens is cut through ¾ of its depth. The aqueous is evacuated and trituation is done by massage with the finger applied to the eyelid. Iodoform is dusted on and a bandage applied. In the evening the bandage is changed and atropin instilled. After a few days, when the cataract is found to be completely ripe, section is done and it is delivered. Capsular cataract may be operated upon later, if necessary, if cell irritation has subsided.

If the lens swells too rapidly the procedure must be modified. Cyclitis or glaucoma may occur, but M. has been led to do iridectomy once only. He prefers to operate on both eyes simultaneously. If one eye only be operated on binocular vision is impossible. Low visual acuity is no contra-indication to the operation. The improvement is usually considerable. The operation is indicated in keratoconus with myopia, but the production of leucoma upon the corneal apex with galvano-cautery is better in these cases. The next section is devoted to precautions for preventing myopia and its complications. The conclusion consists of a review of the cases in which the operation was used successfully against myopia. H. V. W.

Conjunctival Flaps in Wounds of the Ciliary Region.

NORMAN-HANSEN, C., Copenhagen. (*Centralbl. f. prak. Augenhkde.*, Dec., 1896.)

Perforating wounds of the ciliary region belong to those affections of the eye which so far have been treated with least satisfactory results. If no foreign body has penetrated to the interior of the eye, and if the wound has not caused great laceration, there are still many other dangers. Antiseptic treatment cannot remove all the possibility of danger from infection on account of the slowness with which the scleral wound heals, particularly if the ciliary body protrudes into a gaping wound. Often the irregular form of the wound renders ineffectual every attempt to suture the sclera and the ciliary body is exposed to infection for a long time with the constant danger of sympathetic ophthalmia. Of greatest importance is bulging and prolapse of the ciliary body. If the prolapse is not present at the time of injury it may be developed later, and as long as the ciliary body is covered with granulations between the edges of the wound, or later is included in the cicatrix, there is danger of infection, of phlegmonous inflammation of the eye, and a sympathetic implication of its fellow. The treatment of such wounds (so far as immediate exenteration is not indicated,) is limited in most cases simply to expectant and aseptic treatment, which in many cases conduces recovery. The scleral suture may be used in those cases to which it is suited, but of the results there are no data at hand. Randolph has proposed that when the wound has involved the corneo-scleral boundary and has injured the lens that the wound be enlarged and the lens extracted in order to prevent the increased intra-ocular tension, which the swelling of the lenticular masses inevitably causes. H. has treated such wounds as were not suitable to the suture methods in the expectant manner, assisted by the method which is described below. Its great simplicity and the fact that it will very probably lead to excellent results and rescue the eye highly commends it.

Case I. A laborer received a blow on the right eye by hot rivet tongs; seen three hours later and found an irregular triangular wound in the regio-ciliaris extending externo-inferiorily. The basis of the triangle was 8 m.m. and parallel with the corneal margin, about 2 m.m. from it and the apex extending 6 m.m. further. The whole area was covered with a soft ash. The iris was drawn toward the wound. The eye was slightly injected and but slightly painful. The ash was removed under cocain, when the ciliary body was found prolapsed with the iris into the whole area of the wound. The prolapsed iris was cut off when a small portion of the vitreous was found protruding.

On account of the size and form of the wound it was impossible to suture. With small scissors the sub-conjunctival tissue was loosened all around the wound. The conjunctiva was then drawn over the wound and united by three stitches of fine silk. The recovery was uncomplicated. The sutures dropped spontaneously in one week. The conjunctiva was firmly united over the wound and the dark gray ciliary body could be seen through it. After the first few days it did not bulge. After two weeks the appearance was that of a cicatrix following operation for strabismus, with a small darkened area in the wound. Within a month the patient had resumed his labor. During the entire course there were no symptoms of irritation and at no time was there the slightest danger of sympathetic ophthalmia. The appearance of the eye 30 days after the trauma was that of an otherwise normal eye in which broad iridectomy had been done. There was a linear cicatrix marking the site of the injury. The anterior capsule toward the injured side presented fine stripes and small spots which did not extend to the center. V. 6/IX through the stenopaic slit. Tension normal. Ophthalmoscopic picture normal. H. does not overlook the fact that the trauma was cautery, and may have contributed to the favorable results. However, a short time before he had lost an eye, which had received a similar wound, by acute phlegmon of late onset. Never before had he seen recovery in so short a time. On account of the great laceration it was impossible to suture, and there was no alternative but to make the conjunctival flap. The course of recovery was so favorable that it would lead one to think of using the method in some serious wounds of the ciliary region. In fresh wounds such as rupture of the sclera or simple incision of the sclera the conjunctiva may be torn from the wound after loosening the sub-conjunctival tissue just as in operation for strabismus.

Where the lens has been injured and lenticular masses projected between the edges of the wound immediate extraction is indicated, after which the conjunctival flaps may be made.

In old wounds where infection is suspected the conjunctival flap may be made after galvano-cautery has been done. This method is of first importance in ectatic and cystic cicatrices and staphylomata of the cornea as a prophylactic method. In fresh wounds of the cornea which are near its margin this method may be used. After cataract extraction where the condition seems to require it, as when there is chronic blennorrhœa of the lachrymal apparatus, the conjunctival flap should be made. The sub-conjunctival tissue is loosened along ⅔ of the circumference of the cornea and two fine silk sutures will serve to draw it up over the corneal incision. Favorable recovery may be expected. H. wishes to lay special emphasis upon the applicability of the conjunctival flap to great wounds of the eye.

H. V. W.

Paralysis of Convergence.

Straub, M., Amsterdam. (*Centralbl. f. prak. Augenhkde*, Jan., 1897.) The musculi abducentes constitute a system which is opposed to the muscles of convergence, and which is brought into action in the restoration of the visual axis to a parallel status after an act of convergence. One internus and one externus form a system for physiologic lateral deviation. In the cases cited the abducting muscles were insufficient for divergence but sufficient for turning the eyes laterally. Parinaud worked this subject up thoroughly 10 years ago, but since then it has received very little attention. S. has encountered a symptom which Parinaud did not mention, for which there is a simple physiologic explanation, and which seems to be constant.

Case I. An otherwise healthy man of 53 began to complain of ocular fatigue and double vision. The preliminary examination was negative. Both eyes followed the examiner's finger in all directions. But when one was fixed the other assumed a position of slight convergence, thus indicating paralysis of abduction. For if one abducens yield, a disturbance of the innervation of both is in evidence since they together form the symptoms of divergence. R. E. V. 6/XII. As H. 1.5 D. L. E. V. 6/XII. As H. 1.5 D. The candle flame at a distance of 4 m. was seen double with an apparent distance between the images of 50 c.m. That convergence was excessive was evident, and whether this was due to paralysis of divergence was to be ascertained This can be done by having the patient follow the light from side to side. One eye drawn by an internus would follow the light, the other depending upon the abducens would naturally lag and the images separate. If both externi were affected this would be expected to occur when the light moved to either side and the images would be nearest when the candle occupied the medium line. In this case, however, the opposite condition prevailed. The images approached each other as the light was moved to the side or approximated to the patient. At the distance of ½ to ⅓ m. they united. This test is decisive. The patient's divergence power was deficient. After taking potassium iodide for 3½ months his ocular trouble was reduced to a minimum. In lateral vision, convergence and divergence are superimposed, and the reason the images approach is that in looking to one side convergence is more difficult and divergence easier. In fixing an object laterally the tension of both abducens is increased, one by increased innervation, one by stretching. The accuracy of a diagnosis of paresis of abduction is not invalidated even if it is not apparent in laterally directed vision.

In two cases S. found the same approximation of images in the lateral fields, and considers it a symptom of paresis of divergence. He believes that divergence is a function separate from lateral rotation of the eye, and that it is presided over by a distinct cortical center. A case is cited in which motion sideways was greatly impaired, but in which divergence was normal. Berry, of Edinburgh, maintains the view that a special innervation of divergence is superfluous and non-existent. S. knows a case in which there was greatly deficient lateral innervation on both sides, but divergence and convergence both were normal.

Case II. A woman, age. 29. V., R. and L. 6/12. Ref.

H. + 1, D. Is physically sound. Has experienced diplopia for 3 months. The movements of the eyeball in all directions was normal. Abduction was excessively strong. In fixing distant objects there was convergent strabismus. At 1.5 m. two images of a candle flame were seen 50 c.m. apart. When moved 30 degrees to either side the images appeared 25 c.m. apart. On being moved further toward the periphery of the field the images fused. On approximating the candle to the eye it was seen singly at 36 c.m. Parinaud thought paralysis of divergence present if diplopia occurred in all parts of the field when the object was removed beyond a certain limit. S. adds fusing of the images in the lateral borders of the field, an observation original with himself, and substantiated by his further investigations.

Symptoms of paralysis of divergence:

1. Diplopia with normal lateral movements of the eye.
2. Convergent strabismus in distant vision.
3. There is diplopia for objects in the median line at a certain distance. On moving the object toward the eye the images approach until they fuse, which usually happens at the far point of convergence.
4. The double images gradually approach each other as the object is carried laterally from the median line. This phenomenon is most sharply defined when the radius of the arc is slightly greater than the far point of convergence.

H. V. W.

Cataract Discission.

Elschnig, Anton, Vienna (*Wien. Klin. Woch.*, IX, No. 53, Dec. 31, 1896.), contributes a lengthy and exhaustive monograph upon discission. He gives a thorough historic retrospect and careful study of the present status of the operation. It was the earliest operation done for cataract; first done by Henkel after Celsus (1770), who made a scleral puncture and ruptured the posterior capsule in order to get absorption of the lens. Later couching came into vogue, the lens being depressed into the vitreous or into the anterior chamber. In 1788 Beer did discission with his cataract knife. He thought that the operation, although often difficult to peform, was theoretically the best then devised, and his opinion is still recognized. Early in this century, Saunders, an Englishman, made valuable contributions and advised discission for congenital cataract only. Scarpa recommended discissio per corneam as safer than per scleram. Rosas advised it as a last resort in high myopia. The term "discission" was first suggested by Beer, and "dislaceration" by Jaeger and Jungken.

v. Arlt considered discission in two classes: (a) Those in which the anterior capsule was ruptured to expose the lens to the aqueous. (b) Those following cataract extractions. He preferred corneal puncture. According to v. Graefe the operations included in the first class must be very limited in number and the principles which he laid down are still valid. Glaucoma and iridocyclitis are dangerous sequelæ which cannot always be avoided. v. Graefe proposed that iridectomy be done one week prior to the discission as a means of eliminating these dangers. Whether the iris should be mutilated in order to obviate the dangers mentioned is a question for consideration in every case, particularly since it cannot be thought to give absolute security in every case. Eyes react very differently after discission, and it is impossible to state the etiology of the phenomena which follow, but when done for lenticular opacity the condition of the lens substance is of importance and too little attention is usually paid to it. It may be that the debris acts as a chemical and mechanical irritant to the iris and ciliary body, or, as Schnabel suggests, the swelling of the lens may cause undue pressure or tension upon the iris and ciliary body and cause iridocyclitis. The lodging of particles of debris in the filtration angle is cited as a cause of increased tension of the eyeball. In lacerating the capsule too great tension may be made upon the zonula and violence be done it with serious results. The wound in the capsule may be too small or the lens be particularly dislocated. There is great liability to these errors when the old technique is followed. E. has made radical changes in the operation and uses a small cataract knife.

In discussing v. Arlt's second class of operations E. states that the original needle operation has little to commend it, as vision was rarely much improved by it and suppuration frequently followed. Many operators agree in attributing these bad results to faulty technique. The established procedure called for puncture per scleram, which is quite indefensible on account of the falacy of operating in the dark and the danger of intra-ocular hemorrhage. When improperly constructed instruments are used the cornea may be wounded and bruised excessively in the operating per corneam, and fibers of vitreous may be drawn into the wound when infection may easily occur. Antiseptic precaution cannot be relied upon since the field of operation cannot be rendered perfectly sterile. That the needle leaves a torn, ragged wound is often shown by the distinct scar formed in healing. No instrument is less suited to the purpose than the "discission needle." Good and even excellent results have been secured by scleral puncture with the knife. A modified Graefe knife, which fills every indication for discission, has been in use for some years and is entirely satisfactory.

Schnabel's technique requires that the puncture be made in the sclero corneal junction, which he thinks gives quicker healing and excludes the possibility of vitreous protrusion. The discission knife point is approximated to the eyeball laterally in the horizontal meridian 1 m.m. external to the limbus, the flat of the blade being parallel to the iris. It is passed into the anterior chamber until the point reaches the center of the pupil, then by reversing the motion the capsule is cut. The knife is carefully withdrawn and the anterior chamber remains normal. This procedure combines all the advantages of the needling operation with none of the disadvantages.

E. commends this as the best known method of doing discission for lenticular cataract, but prefers the following for very thick capsules following cataract extraction: The small discission knife is entered near the upper edge of the cornea perpendicular to its tangent, passed to the lower margin of the pupil and made to sever the capsule through its entire vertical extent. In this way the knife is used to the greatest advantage since it is perpendicular to the capsule. If the capsule does not cut readily a slight sawing motion may be made regardless of the vitreous. A disadvantage of the operation is that the vitreous may follow the knife into the corneal wound, delay its union and increase the danger of infection. But E. in a great many cases has never seen it happen.

It was highly commended by v. Graefe as a maturation process principally in senile cataract. Its effect in this respect varies greatly. Sometimes it causes complete ripeness in a few days, again it may require a very long time. The results are so often unfavorable that it is to be considered entirely unsuitable for a ripening process. It has been shown by Schnabel's observations, in a large number of cases, that all uncomplicated cataracts in persons above 50 may be easily removed without any remainder being left in the eye. It is a matter of utter indifference whether the lens presents a distinctly opaque nucleus or not, or whether the cortex be streaked with opacities or quite unchanged. Those cataracts which show an intensely white nucleus with transparent, bluish-white anterior cortex are least suited to operation, but tend to mature very rapidly. All other cataracts may be safely operated upon as soon as the vision is so reduced that the patient cannot perform his usual duties. H. V .W.

Enucleation and Exenteration.

PFLUGER, E. (*Wein. Klin. Woch.*. Feb., 1897.) In order to prevent sympathetic ophthalmia, enucleation is the only proper operation. Many cases have resulted fatally from purulent meningitis despite antisepsis and enucleation. The advantages of exenteration, a large and mobile stump and less deformity, are not sufficient to counterbalance the increased danger in these cases. Friedrich Stocker concludes from 41 cases with enucleation, that meningitis sometimes occurs notwithstanding enucleation, but not as a result of it. The danger of spreading infection by breaking through the line of demarcation is obviated by careful antisepsis and drainage. H. V. W.

Primary Syphilis of the Conjunctiva.

HITCHMANN, RICHARD, Vienna (*Wien. Klin. Woch.*, Dec. 24, 1896,), reports a case of primary syphilis of the conjunctiva which he justly thinks very rare. The maceration of the epidermis by the tears and pathological secretions, excoriations and ulcerations giving every opportunity for reception of the virus when occasion offers, hence hard chancre of the lids has been not infrequently observed, and of the conjunctiva much more rarely. Most cases have beed consecutive upon infection of the edge of the lid, examples of which have been reported by Thiry, Ricord, Tepliaschin, Boucheron and others. The caruncula lachrymalis and plica semilunaris have been affected in some cases. Only in the rarest cases has the initial sclerosis been limited to the conjunctiva. An avenue for inoculation may be opened by epithelial lesions caused by foreign bodies lodging in the eye, and which may contain the syphilitic virus, but only in the rarest instances. Very few cases are known where infection occurred by unlucky accident. Thus Fournier and Desmarres report a physician who was infected by sputum coughed into his eye while treating the nose of a syphilitic patient.

Denti reports a case caused by a syphilitic child sticking its fingers in its nurse's eye. More cases are known in which infection was caused by objects brought in contact with the eye intentionally or unintentionally and without knowing they were infected. Thus a number of cases were caused by having a specific tongue applied to the eye, a practice common among certain classes; such have been reported by Szokalsky, Vose, Salomon and others. Tubercular conjunctivitis has also arisen in the same manner, as observed by Prezel. Thiry reports the case of a sailor in whom a hard chancre of the conjunctiva occurred by auto-infection. Suffering with chancre of the penis he was accustomed to retract the prepuce daily for therapeutic purposes. During this time he received a bit of rust in the eye and applied his fingers to the eye. Three weeks later a distinct indurated lesion had developed. Reiss contributes a case in which the virus was conveyed by a brush used in treating trachoma. Smit had a case due to a kiss upon the eye. Finally, it is easily understood how infected kerchiefs. sponges and towels may be the means of contagion.

H. carefully reports the following case from personal observation: When first seen the patient had had a swollen upper lid on the right side for four or five weeks, with purulent discharge, but painless. He appeared healthy. The induration extended to the upper inner edge of the orbit, and the conjunctiva was in a condition of catarrhal inflammation. On the surface of the conjunctiva of the upper lid, and also on the ocular conjunctiva, were small ulcers, around which the tissues were thickened and infiltrated. The two ulcerated surfaces were opposed to each other. The ulcers were not very sensitive, and the lymph glands on the right side of the head were enlarged. Patient said he had never had syphilis, nor been in near relation with a syphilitic, but that a driver of one of his cabs had syphilis and possibly they might have used the same towel. A diagnosis of primary lesion of syphilis of the conjunctiva was made, and a section of the ulcer excised for examination. A placebo was given, and 18 days later he appeared with a general macular exanthema. The lid was much less swollen, but some ptosis was present, and a partial posterior symblepheron had formed. Mercurial inuctions were ordered. Two months later all eye symptoms had vanished, except slight injection and swelling of parts of the conjunctiva. Zinc sulphat was ordered for the eye, and one month later no ocular symptoms were perceptible except the symblepharon. The microscope showed thickening of the epithelium and areas of colloid degeneration. Beneath this was a layer of almost normal, but slightly infiltrated connective tissue. A round-celled infiltration followed the vascular distribution principally. In some places newly formed connective tissue fibers were visible. The adventia, or peri-adventia of the vessels in the upper strata were sparsely, in the strata densely, infiltrated with small cells. Endothelial proliferation could not be made out with certainty. The surface of the ulcer was denuded of epithelium and covered with a detri of broken down blood capsules, leucocytes and fibrin. In cases where a positive diagnosis of syphilis cannot be made, even with the assistance af the microscope, secondary eruptions should be awaited. H. V. W.

Psychic Disturbances Following Ooular Injury.

SZUMAN, S. (*Munch. Med. Woch.*, No. 1, Jan. 5, 1897). The more prominent etiologic factors in the psychoses in question are:

1. Violent irritation of the sensory and motor nerve filaments in the eye from operation or injury.
2. Resulting blindness or reduced visual acuity.
3. Anxiety from apprehension of impending blindness.
4. Discomfort of being kept in darkness, as is often required for therapeutic purposes.
5. Predisposing causes: alcoholism and age.

Thirty-five cases have been reported by Frankl-Hochwart, Seitz and v. Simi, in which violent agitation, great changes in disposition, melancholy, hallucinations, delusions, suicidal and eratic impulses were observed after ocular injuries or operations.

S. reports a case in a male of 37, who was injured by a foreign body in the left eye, followed by violent pain. After 14 days he consulted a physician, who operated with benefit to the eye. Later, pains began again, extending from the eye to the vertex. Clonic twitching of the left arm, side of trunk and leg followed. Patient became restless, irritable and very sensitive. Later developed melancholy, absent-mindedness, lost his energy, and his mental faculties deteriorated. Illusions of sight and hearing were experienced. A thoughtless attendant told him that a patient who had had muscular twitchings became idiotic. His mentality diminished for seven months, when he was able to answer questions with a shake of the head or stutteringly after a long interval. S. diagnosed dementia acuta as a psychical result of the injury to the eye.

Treatment—Warm baths, general massage, walking and mental exercise. Careful massage was applied to the affected eye for three months, and largely removed the leucoma. The vision increased from light perception to the recognition of all the colors of the spectrum, and was for distance V. $\frac{1}{3}\frac{1}{2}$, for near V. $\frac{1}{3}$. S. concludes that the anatomic-pathologic casues were:

1. Injury of the eye with septic inflammation.
2. The disfiguration of the eye.
3. The almost complete loss of vision.
4. Increased irritability, excitability and sensitiveness, and resulting reduction of resistance to external factors.
5. Suggestion and auto-suggestion. H. V. W.

Ichthyol in Ophthalmology.

(*Munch. Med. Woch.*, No. 8, Feb. 23, 1897.) In the clinic of Panas ichthyol has been used in numerous cases of inflammatory infections, such as acute and chronic catarrhal conjunctivitis, phlyctenular and follicular conjunctivitis. and in the varieties of blepharitis. It was used in aqueous solution and as an ointment with vaseline in strengths varying 2½ to 5 per cent. It gave excellent results in all the conditions mentioned. It was tried in ophthalmia neonatorum, but is much inferior to the classic treatment. It has a vaso-constrictor and anæsthetic action. It is slightly astringent, and checks secretion markedly. In pannus it gave good service in clearing up the opacity, being combined with massage for a longer or shorter time, according to the severity of the affection.

H. V. W.

The Usefulness of the Visual Field in General Diagnosis.

SCHLOESSER. (*Munch. Med. Woch.*, No. 5, Feb. 2, 1897). The patients examined were not affected especially with eye disease, but showed a morbid condition of the field after the onset of some general affection. In all there was contraction of the field, varying with the intensity of the disease, and returning to the normal more or less completely with convalescence. The field may be regarded as a barometer of the physical condition, since it narrows with such disturbances of the health as indigestion, as well as the acute infections.

Examination of the visual field is thought one of the finest tests of the nervous system. It is well to take it with the single colors rather than with white, the sum of all. A case of severe postpartum hemorrhage showed concentric contraction of the visual field to 5°. In another case of severe hemorrhage the field was reduced to 10° of central vision. Both returned to the normal with restoration to health. A case of croupous pneumonia with high temperature presented narrowing of the field to 20 deg. which rapidly expanded upon the occurrence of crisis. This is usual in pneumonia. A case of typhus abdominalis showed a visual field which contracted during the period of high temperature, and expanded gradually in correspondence with the decline of temperature. A case of malaria showed alternate contraction and expansion varying with the febrile and afebrile periods. A case of diphtheria especially showed regular alteration in the field. In cases of functional disturbances, malnutrition, neurosis, functional or organic, and those conditions of profoundly disturbed nutrition, hysteria and neurasthenia, the field is a useful index to the general condition of the patient. H. V. W.

Tests for Simulated Blindness.

SEGALL, S. L. (*Munch. Med. Woch.*, No. 52, Dec. 29, 1896), gives several tests for the discovery of simulated blindness. Place + 1.00 D. cylinder before the eyes, the axis of one vertical, the other horizontal. If the vision be as good with both eyes as it was with the ostensibly sound eye the blindness is feigned. With equally good eyes a candle flame appears as a luminous cross through strong cylinders thus arranged. With a strong plus lens in front of the normal eye and a plane glass before the other a luminous point appears as a bright disc besides which is the flame if both eyes retain their vision. If plane lenses with their surfaces sprinkled with lycopodium be placed before the eyes the flame seems surrounded by a rainbow. If the lens before the professedly normal eye be cleansed and the rainbow still be visible feigned unilateral blindness is proven. The same test may be made before a mirror with the light behind the patient. Similar letter or figures of different colors seen through a stereoscope with both eyes appear gray, white, etc., according as the colors are complimentary or not. H. V. W.

Raw Petroleum for Conjunctivitis.

DUBAT, LEON (*Munch. Med. Woch.*, No. 52, Dec. 29, 1896), speaks of the therapeutic effect of raw petroleum for conjunctivitis as originally suggested by Trouseau. It is commended in catarrhal, diphtheritic, acute and purulent granular conjunctivitis after the greatest intensity of the inflammation has subsided. It is applied directly to the conjunctiva with a brush once or oftener daily. The treatment is painless and free from danger, even when corneal complications are present. H. V. W.

Chronic Cocain Poisoning.

RYBAKOFF (*Munch. Med. Woch.*, No. 43. Feb., 1896,) emphasizes the importance of Magnan's symptom in chronic cocain poisoning. It consists of paresthesia described as a sensation of sand or bacteria under the skin. A case is reported in which this symptom occurred as a result of poisoning by vaginal tampons containing cocain. The amount of cocain employed is not stated, but upon its discontinuance the symptoms of intoxication subsided.

H. V. W.

Relations Between the Eye and Ear in Pathological Conditions.

OSTMAN, H., Marburg (*Berl. Klin. Woch.*, Dec., 8, 1896), says that the ocular muscles are often affected reflexly from the acoustic nerve in diseases of the labyrinth and middle ear. From careful study of the subject with thorough investigation of the literature bearing upon it, O. concludes that as yet it is impossible to give data of diagnostic value, differing in this opinion from Urbantschitsch. O. believes that ocular muscular symptoms occurring during the cause of suppurative otitis media may be indicative of intracranial disease or be caused reflexly through the labyrinth. It is of importance in deciding upon therapeutic measures to determine whether either are involved. The cases are rare in which the ocular muscles or papilla become directly affected from ear disease. A beginning redness of the optic papilla may occasionally occur. There is such irregularity in the occurrence of single ocular symptoms as to render their usefulness in diagnosis with our present knowledge unreliable to a high degree. In order to get the information necessary for differential diagnosis it is desirable that good clinical and anatomico-pathologic observations and reports be made. H. V. W.

Wandering Cells In the Cornea.

BUDDEE, GEO., Greifswald. (*Arch. f. Path. Anat. u. Phys.*, Feb. 5, 1897.) It is accepted as axiomatic in pathologic anatomy that cell forms can occur in connective tissue only by direct or indirect sell-proliferation or by the entrance by migration of cells from without. The conclusions of Senftleben and Leber, based upon biologic research, that devitalized corneæ underwent changes similar to those of inflammation upon being transplanted are shown to be erroneous. Truly dead corneal tissue remains reactionless, but apparently dead cornea may revive in a lymph current and present a prolific increase of nuclear and cellular forms. The migration of cells into the tissue and its ability to react is presumptive evidence of some vitality.

I. The vicarious cell-forms in inflamed corneal tissue are similar to leucocytes.

II. Simple traumatic keratitis begins at the periphery and spreads to the center.

III. However great the number of pus-corpuscles present, the growth of the corneal cells progresses in regular order.

From a great many experiments B. finds that the cellular elements of the cornea possesses the peculiarity of being able to reduce gold. This is a property not possessed by leucocytes, pus-corpuscles, nor the cells of any other tissue. From very elaborate experiments B. concludes:

I. The wandering cells found in the cornea are distinctly separable from leucocytes in morphologic qualities, size, form, staining affinity and refraction as shown by improved histologic technique, maceration and staining with gold, gilding with blood and pus-corpuscles and injection followed by gilding.

II. It is proved that peripheral keratitis has lost its significance in the etiology of central keratitis.

III. Cohnheim's theory of the passive behavior of the corneal cells is now invalidated.

IV. The theory of immigration, which is the histologic foundation of Cohnheim's theory, is no longer tenable for the cornea. Neither is the proposition that leucocytes are capable of penetrating dead tissues longer defensible.

H. V. W.

ABSTRACTS FROM CURRENT AMERICAN AND ENGLISH OPHTHALMOLOGICAL LITERATURE.

BY CHARLES H. MAY, M. D.,

NEW YORK.

The Graduation of the Squint Operation.

LANDOLT, EDM., Paris (*Archives of Ophth.*, Jan., 1897).

"This article was suggested by the discussion on the same subject at this year's meeting of the British Medical Association (at Carlisle), in which I had the honor to participate. Dr. Maxwell, of Dublin, opened the discussion with his very interesting paper, from which I received the impression that the so-called clinical rules for graduation in squint operations can hardly be further maintained. In my opinion, we cannot speak of obtaining a certain effect by graduation in squint operations until the nature of strabismus, and the action of the operation for it, are better understood. For even our knowledge of the physiology and anatomy of the ocular muscles is still insufficient. According to the theory of Donders, which is no doubt correct, concomitant strabismus is a *binocular* affection. Measurements of the ocular movements, as well as the direct inspection of the muscles during the operation, have shown that in strabismus *convergens* both *external* recti muscles, and in strabismus *divergens* both *internal* recti have grown weaker, probably from want of proper use. This seems to call for *strengthening* the action of the weakened muscles in correcting the deviation, instead of weakening one or two healthy muscles by tenotomy: advancement of the external recti in strabismus convergens, and advancement of the internal recti in strabismus divergens. Nevertheless, tenotomy is still much in vogue, because it is easier than advancement, and especially because the effect of the two operations is not yet clearly understood. The center of rotation of the eyeball has been supposed to be immovable, so that after tenotomy the eye must turn about the center in the opposite direction, and after advancement in the direction in which the muscle acts. Thus, the result of either operation was held to be materially the same, viz., decreased mobility in the direction toward the tenotomized muscle, or in the direction away from the advanced muscle, and increased mobility in the direction of the advanced muscle, and in the direction of the rectus antagonizing the tenotomized muscle.

This view, however, is incorrect. The center of rotation is by no means a fixed point in space, but its location is due to the resultant effect of all the forces which hold the eyeball in position and which move it. Of these forces some, such as the recti, retract the eyeball, while others, holding these in check, draw the eyeball forward. If the action of the former is weakened as by tenotomy, the latter gain ascendency and draw the eyeball forward. For this reason the tenotomized muscle re-attaches further back on the ball. This retraction of the insertion of the muscle is, however, in greater degree due to the rotation which the eyeball undergoes from contraction of the antagonist muscles. We also do not take sufficiently into account the fact that the tenotomized muscle itself contracts more than its antagonist, since it is stronger. This is the third reason why the new insertion of the tenotomized muscle falls behind the normal insertion, thus lessening its effect on the mobility of the eye.

The effect of the muscle is lessened, however, from still another reason. The measurable excursions of the eyeball, the borders of the field of fixation, do not, as supposed, represent the total rotation which the muscles can impart to the eyeball. Their contraction is actually interfered with by strips of connective tissue ("check-ligaments," "*Hemmungsbander*," "*ailerons*," "*tendons d'arret.*") which arise from them and run toward the orbital margin. These ligaments follow the muscle. After tenotomy the ligaments recede also. Thus its checking influence will set in earlier.

From all these considerations it may readily be conceived how much the mobility the eyeball must suffer after tenotomy. The diminution of the ocular movements is revealed by the contraction of the field of fixation and the lessened range of convergence. Indeed, the success of tenotomy depends on the decreased mobility, as is conceded by the advocates of this operation.

They are deceived, however, first, in regard to the effect of tenotomy on the antagonist muscle, since they think that the antagonist gains what the tenotomized muscle loses, which is not the case. From the exposition of the mechanism of tenotomy given above, it follows that the antagonist never gains, if it gains at all, as much as the divided muscle loses. The eye, by the operation, is drawn forward out of the muscle cone, so that the muscles embrace it less than before. Therefore, their influence upon rotation is lessened, as may be proven by measuring the excursions and the symmetrical movements of the eyes after tenotomy. Secondly, the assumption is wrong that advancement has the same effect, and that it is, therefore, open to the same objections as tenotomy. On the contrary, advancement forces the eye deeper into its motor apparatus, and the muscles embrace it more extensively. With the resulting increased contact the effect of the muscles on the mobility of the eyeball is increased. The check-ligament is advanced also with the muscle, and its checking action comes more into play. The field of fixation shows a considerable extension on the side of the advanced muscle, *without limitation* on the side of the antagonist. This is not surprising, since the latter remained unchanged. The opinion is general that a muscle loses power, if its antagonist gains power. from the increased resistance of the latter. This resistance does not become active except through contraction of the muscle, which follows an impulse of innervation. Suppose the left externus to have been advanced. In looking to the right the internus is chiefly innervated and the externus relaxed, so that the function of the internus is perfectly free, the increased power to the externus being only perceived in the movement to the left. Thus, the convergence increases after advancement of the internal. the divergence after advancement of the external muscles, without limiting the function of the antagonists. Herein lies the advantage of advancement over tenotomy. In twenty years' practice we have never had an over-correction after advancement, which is frequent after tenotomy. We have never produced a strabismus, which can hardly be avoided after tenotomy, at least in the secondary position. The advancement has also the cosmetic advantage of not causing annoying protrusion of the eyeball, sinking of the caruncle. or exposure of the sclera. So much for strabotomy in general.

As to the graduation of its effect, we meet with many errors and illusions. We can hardly regulate the re-insertion of a divided or advanced muscle on the globe, nor does the action of a muscle depend merely upon its attachment to the eyeball. For we learn from daily observation, that the effect of an operation on the mobility of the eye and the synergy of both eyes, *i. e.*, the correction of the strabismus, may be very different. We cannot graduate the effect during the operation. Nature does it with us, if we make use of its efficient help; against us, if we neglect it. In the first place, the operation aims at the removal of an impediment, which nature alone cannot effect. But this is not all. We must resuscitate, strengthen, and make use of the powers and influences by which nature regulates the associated movements of the two eyes, *viz.*, the association of convergence and accommodation, but principally *binocular vision.* In our opinion, the operation is only a stage in the complicated treatment of strabismus. The treatment must be governed by exercises for attaining binocular vision. Mydriatics, spherical, cylindrical, and prismatic glasses, and exercises for convergence and divergence are also useful for regaining a harmonious action of both eyes. Graduation in squint operations is effected by optical and orthoptic treatment. It is not impossible during the operation, in which we must confine ourselves, to proceed more energetically, *e. g.*, to shorten the advanced muscles of both eyes by resecting the tendon in strabismus of high degree and long duration with little disposition toward binocular vision. (In the highest degrees a moderate tenotomy may become necessary some weeks or months after these two operations.) In strabismus of moderate degree, the muscles of both eyes must be advanced as far as possible without resection and tenotomy. The advancement of the muscle of one eye is scarcely sufficient in manifest strabismus; but the operation on the second eye may be postponed until the effect of the first operation has become permanent. Insufficiency of divergence, and particularly of convergence, is generally cured by unilateral advancement, where non-operative treatment does not suffice.

I have written much about the advantages of muscular advancement, and little in regard to my method of operating, since the success of the operation does not depend on its details, and since I wanted to avoid narrow discussions of such an important question as the principles of squint operation. If the insertion of a severed muscle is permanently brought as near to the cornea as possible, our aim is obtained. This can be done by more than one method."

Dr. Landolt then describes the operation of advancement as he practices it. Concerning after-treatment he says: "In convergent squint the effect of the operation is increased by paralysis of accommodation. Therefore, atropine is instilled into both eyes, as long as there is any tendency to convergence. Exclusion of light, rest, and occlusions of the eyes have the same effect. The binocular bandage remains at least five days, for the healing of the wound. In convergent squint it is re-applied for several days more, for the above reasons. Then it is replaced by correcting convex glasses. The sutures need hardly ever be removed before the sixth or the seventh day. In divergent squint, accommodation and convergence assist the operation. As soon as the advanced muscles are firmly attached, one eye is left free. After one or two weeks the methodical exercise of convergence may be commenced."

Remarks on a New Method of Treating Certain Deviations of the Eyeball.

TAYLOR, CHARLES BELL, M. D., F. R. C. S. E. (*Medical Press and Circ.*, March, 10. '97.)

The writer prefaces the description of his method of operating by the remark that "the operation which is almost universally adopted for the correction of deviations of the eyeball, especially when the deviation is outward, is complicated, tedious, and somewhat uncertain in result." A description of the ordinary method of advancement taken from Berry's treatise is then given: "This is Graefe's modification of Critchett's operation, and has been still further slightly modified by Schweigger and Prince. The modifications have, however, not succeeded in rendering the operation less tedious or more simple. I have, therefore, endeavored to improve upon the method by operating in the following manner: I hook up the tendon of the internal rectus muscle and divide all its connections with the eyeball; I then pull it well forward, and by two horizontal incisions made with scissors convert it into a narrowish strip; I then transfix the base of this strip as far back in the orbit as possible with a large curved needle connected with a thread armed at both ends. Before drawing the thread through I cut of as much of the tendon as may be considered necessary, and then having drawn it through, I. with the remaining needle, pierce a small portion of the sclerotic about the site of the insertion of the inferior rectus tendon, and having thus secured control of the eyeball, turn it inward to any required extent by simply tying the thread. This operation, which I have practiced for years, is as successful in result as any operation of the kind can be: it is scarcely more formidable than the operation for internal squint, may be undertaken without any anæsthetic, and admits of rapid execution; the only portion of the procedure which presents any difficulty is the piercing of the sclerotic, as the ordinary needle is apt to cut its way out. to slip with the blood and grease, and is, as a rule, not sharp enough for the purpose. I have, therefore, had needles made with the same caliber throughout and as sharp as possible, and have avoided the other complications by making the insertion of the thread the first step of the operation. This done, and control of the eyeball secured, the rest of the operation becomes as simple as can be, and it is quite as easy to operate for external squint as internal squint, to obtain ample control of bad cases of internal squint, and to neutralize at once and with ease, any over-correction, the result of too much zeal in operating for internal, external, or any form of squint."

Strabismus Due to Undeveloped or Contracted Check-Ligament, and Operation for Its Relief.

COLBURN, JOSEPH ELLIOTT, M. D., Chicago, Ill. (*The Ophthalm. Record*, Jan., 1897.)

The writer mentions the structures which suspend the eyeball in the orbital cavity and hold it in place. Among these are the orbital faciæ, including the check-ligaments. He quotes from Morris' Human Anatomy, giving a description of the anatomy of the internal and external check-ligaments. Dividing the causes of strabismus into 5 classes, he gives the histories of four instances of this condition due to faulty development of the static soft structures. Concerning this class of cases he says: "Strabismus, in this class of cases, is not due primarily to too short internal recti or insufficient external muscles, but to a contracted or undeveloped internal check-ligament, restraining the abductors in their attempt to produce parallelism, or to rotate the eyes through their entire lateral range. Two of these cases were hypermetropic, one was myopic, and one emmetropic; all were cross-eyed at birth, and never practiced co-ordinate fixation. All were conscious of the sensation of being eye-tied, and of the relief following operations, according full range of rotation without change of the position of the head for any part of the normal field." The following is the description of the operation for relief in these cases, though to properly understand the steps it will probably be necessary to consult the illustrations which accompany the original article:

"Enter the conjunctiva to the canthus side of the rectus muscle attachment. Incise the tendon, taking care not to extend the cut in the conjunctiva and orbital fascia beyond the line of the incision; this can be done by having an assistant hold the tissue out of the way till the tenotomy is completed. Now grasp the conjunctiva and fascia, and extend the incisions upward and downward to the extent of 2 to 5 m.m. Cut through the check-ligament as described by line of incision. Bring angles of incision. including conjunctiva and orbital fascia (subconjunctival layer of check-ligament), together with a suture, and tie. Make measurement of the operation up to this point, and, if necessary. advance the opposing muscle to secure the desired result. The operation for advancement referred to is the one described by Dr. Stevens."

The Visual Effects of Refractive Error.

BULL, GEO. J., M. D., Paris. (Trans. of the Ophth. Soc. of the United Kingdom, 1896.)

In an exhaustive paper of great interest. and containing numerous reproductions of photographic illustrations, Dr Bull endeavored to "obtain a careful record of the actual characteristics of visual deformation as observed by different eyes, with different kinds of error." * * * "Few things are more important in the common experience of the oculist than the exact appreciation of refractive errors. A reader of Helmholtz's papers on astigmatism might well suppose that that great authority doubted whether there was such a thing as an emmetropic eye. Certainly it is rare, in our experience, to examine any one whose refraction does not in some degree vary from the normal. Every such error must of course– unless it is cancelled or corrected—produce some deformation of what I may call the normal visual image. Hitherto, however, most people have been content to think of all such deformations simply as diminutions of the normal acuity. Instead of analyzing the nature and degree of the deformation which is produced in the visual image of a given set of types by a given error, it has for practical purposes been taken as sufficient te ascertain that the patient cannot read such and such a line.

As I have found it desirable, in my own practice, to adopt for the precise determination of the principal meridians a kind of test—namely, my cross—which I found to be, for certain purposes, a great improvement upon the common clock test, so it occurred to me some years ago that it would be important to analyze more closely what it is that really happens when the acuity of a patient, so far as the ordinary test-types are concerned, is found to be diminished to a greater or less degree by refractive error. For this pupose I resolved to try whether I could reproduce, with the help of the photographic camera, pictures of the test-types of the consulting room, and also of objects in nature as they would be seen by patients suffering from given errors of refraction. This could be done, I thought, by taking photographs with the plate more or less out of focus to represent the vision of myopes and hypermetropes, and with the lens of the objective obliquely inclined to show the distortion of astigmia. I have. however, after further experiment, preferred to adopt the more 'easily measurable plan of attaching the spherical cylindrical lenses of my trial case to the objective of the camera, and I have thus taken a number of photographs in 1892-3, aud again in 1895. The result of these experiments appea s to me to prove that it is possible to fix upon a photographic plate a very curious and interesting record of many of the features of ametropic visual error, applicable to the most diverse forms of objects and the most diverse conditions of sight, but at the same time it also shows that the ametropia of the camera exhibits certain characteristic features, of which I shall endeavor to give some account later on. My plates, however. led me to study more closely the precise observations of vision which characterize the different kinds and degrees of refractive error, and I have been able, by following this path, to arrive at certain general results which may be both of theoretical interest and practical value. The starting point for these considerations is the well-known phenomena of doubling, which is a familiar experience in the ordinary cases of astigmic vision. It is not uncommon to find patients who, on looking at the test-types in the consulting room, will report that they see two lines of type instead of one. It will, I think, be found that actual doubling of this kind is observed, in ordinary cases, only where the object is a line of relatively small dimensions or a simple system of such lines. A closer observation of the figures presented by the test-types, when seen with my own or with an artificial astigmia beyond the range of complete accommodation, convince me that the double vision in such cases might be described as the imperfect superposition of a series of faint multiples of the original letter.

Before considering the more symmetrical series of cases presented by an ascending series of M or H, and the variations of this scheme produced by the different forms of As, it will be desirable to note a common phenomenon which has, no doubt, been often observed, though I am not aware that it has yet been accurately studied. I describe the case, not so much for its own sake, as because it may serve at the outset to convey a definite idea of that which, as I hope to show later on, is the type or general law by which the visual effects of refractive error may in all cases be explained, and in particular I have satisfied myself by a large number of observations that it is the key to that doubling of letters or other objects which has led to characterize certain forms of refractive error as *diplopia*.

Let us take then the case where a hypermetrope who has no astigmic error whatever, looking at my cross at 5 or 6 meters, relaxes to a considerable extent. As soon as he ceases to employ the focussing power necessary for sharp definition of the object, he will see—in place of two bands of 2 m.m. in width, and of a uniform blackness—two systems, each of which will be of greater width and of diminished average intensity, but in which the intensity will not be evenly distributed over the width of the image. In the normal case, I believe that the outer margins of the figure will be found to be columns of relatively dark shadow, and the interval between them will be a distinctly lighter gray. In many cases, however, the first form may seem to be rather that one margin of the image will be a relatively dark and distinct column, and the other a diffused shadow without any definite edge.

If the observer now relaxes to a slightly greater extent he will notice that the image has become more complex. The outer dark columns will seem to be further apart, and a central dark line, which may often be taken for the true line, will be observable in the center of the gray interval. Some observers see the two outer bands of a comparatively bluish color, and distinctly contrasted in color with the middle one, which is described as a brownish black. If the relaxation is pressed to a still further point, the system will be found to grow still wider, and with good illumination a careful observer will detect that each series comprises a larger system of light and dark bands, although, as the intensity decreases in proportion to the width of the system and the number of bars, very accurate observation becomes more difficult. I have found it possible, however, to recognize the presence of systems of at least four dark elements, especially by observing the phenomena produced at the point where the two lines of my cross cut one another. In very high relaxation the figure at this point may be described as a gridiron. A wide square distinguished by a dark margin is observable in the center of the field, the portions of the arms of the cross nearest the center being observable also as systems of diminishing intensity which pass out from the square.

I have described these phenomena in some detail, because I am satisfied, by a large series of observations of various kinds, that they give us a simple type of the visual troubles produced by any kind of error of refraction. The phenomenon itself seems to be properly called the resolution of the visual image, and its most remarkable feature is that as the picture, which was sharply defined at the focus, grows blurred and indistinct, the elements composing it are not distributed by an even radiation in all directions outward, but tend to be distinctly banded into systems composed of alternate columns of light and dark.

The practical importace of such observations will become apparent if we turn now to consider the more complex problems ordinarily dealt with in the consulting room. I am now satisfied that in all eyes and in every case of refractive error, including the common cases of myopia and hypermetropia, the many varieties of astigmatic vision, and the case of objects slightly outside the p.r. or p.p., there is to be found the phenomenon usually denoted by the term *monocular diplopia*, and that this is in fact a process of visual resolution, which in its essence corresponds to the type above described. It is, therefore, erroneous to use the term as if it applied only to a peculiar and relatively rare kind of visual defect. *Monocular* diplopia, in a word, is the common characteristic of all the varieties of refractive error.

It has been heretofore supposed that the phenomena of double or multiple images in monocular vision were so remarkable that they must be a symptom of some distinctive trouble. Stellwag von Carion described such a doubling of lines with great care many years ago, and fancied that he deduced from it the presence in the eye (under circumstances of fatigue) of some characteristics of polarization or double refraction. It has been common to treat the same symptom at the Salpetrière, on the authority of Charcot, as if it were a distinct indication of hysteria. Some of the best optical writers have treated it as if it must be due in most instances to incipient cataract. Leroy treated it in 1889 as a rare condition, due to fatigue of the ciliary muscle. I have myself been able to show that the particular phenomena of fatigue described by Leroy. as also those set out in Stellwag's paper, are due to what I have called "Tarsal Asthenopia," *i. e.*, to a particular kind of temporary corneal astigmia. These special symptoms of fatigue are in so far peculiar that they indicate, as I have explained in the paper in question, that the vertical meredian of the cornea alone is out of focus. I have now to add, however, that any meridian of any eye (illustration of such cases are given later) will always, when its focus does not fall on the retina. afford us examples of *monocular diplopia*, or *polyopia*; and that, in fact, the presence of multiple images in monocular vision is not only not of itself a symptom of special disease, but *is the common law of all cases where, from whatever cause, the object is somewhat out of focus.*"

The Influence of Nasal Disease in Modifying the Quantity and Axis of Corneal Astigmatism.

Lautenbach, Louis J., M. D., Philadelphia, Pa. (*The Ophthalmic Record*, March, 1897.)

The writer believes that he has determined that pathologic conditions of the nasal organs sometimes influence corneal refraction and corneal astigmatism. "In studying my cases of astigmatism with the rule. I have observed that the axis of least refraction when not exactly vertical is more often to the outer (between 45° and 90° in the right eye, and between 135° and 90° in the left eye) than to the inner side of this axis—in my last hundred cases the proportion is 55 to 45. I find that almost all of these cases present catarrhal disease of the nasal fossæ. In those cases where the axis presents to the outer side of 90°, the disease is almost invariably in the nature of thickenings, hypertrophies and polypi; whereas in the other group, the axis presenting within the vertical line, atrophic conditions as well as nearly normal nasal fossæ were far more common. As yet I am not absolutely sure as to the factors determining the swinging inward and outward of the axis of least curvature, but strongly suspect it to be due to nerve stimulation manifesting itself in an increased action of the oblique muscles. In these cases I have obtained, after thorough nose treatment, a change in the axis of from 5° to 20° toward the vertical. While this change in the nasal condition is occasioning a return to a normal corneal axis, it is often observed that the patient's eye symptoms change correspondingly. The head pains, asthenopia, photophobia, giddiness, sick stomach and eye aches vary in intensity, and the glasses which may have been perfectly comfortable when the patient first presented himself, often become useless or even painful."

The Corneal Reflex and the Sight-Hole in the Mirror of the Ophthalmoscope.

JACKSON, EDWARD, A. M., M. D., Philadelphia, Pa. (*The Phila. Polyclinic*, Feb. 20, 1897.)

"The corneal reflex is one of the necessary difficulties of ophthalmoscopy. After we have gotten rid of annoying reflexes from the margin of the sight-hole, the light reflected from the cornea remains, and cannot be avoided. If the pupil be large we readily see into it through the portions not covered by the reflex, but if the pupil be small, the reflex may cover the whole of it, increasing the difficulty and lessening the value of the ophthalmoscopic examination. Now, this corneal reflex is annoying because it gives a diffusion circle on the retina, it being a point of light too close to the eye to be focussed; and this circle of dffusion falls on the part of the retina which we wish to use for the ophthalmoscopic examination (See article by Dr. G. C. Harlan, *Phila. Polyclinic*, Jan. 4, '96). As a circle of diffusion, its size, the position of the retina it occupies, depends directly on the size of the aperture, through which light is admitted to the eye. The aperature is, in this case, the sight-hole of the mirror, this sight-hole being smaller than the pupil. Hence, by reducing the size of the sight-hole of the mirror, we reduce the circle of diffusion from the corneal reflex, and greatly facilitate the examination of the fundus through the undilated pupil.

"There are other advantages that the reduction of the sight-hole gives, as gain in the illumination of the eye examined, and reduction in the blurring caused by regular and irregular astigmatism. Here I only wish to call attention to this gain in the reduction of the corneal reflex. Knapp and Loring perfected the ophthalmoscope as an instrument for the measurement of refraction, and for that purpose chose the sight-hole of between 3 and 4 m.m. That use of the ophthalmoscope was never its most important use, and has become less important since the introduction of the shadow-test. We may wisely modify the instrument by reducing the sight-hole to about one-half that diameter, to 2 m.m., or less."

Recurrent Ptosis.

HAYNES, W. H., M. D., Brooklyn, N. Y. (*N. Y. Med. Journal*, Feb. 13, 1897.)

The writer gives the history of an example of this condition occurring in a girl of thirteen; with the ptosis there was migraine and anæsthesia of the supraorbital branch of the fifth nerve. The following resumé of what is known of this disease is given:

"This is eminently a disease of childhood and youth, as nearly all the cases reported occurred during the first and second decades of life, or the early attacks took place during that time. It occurres equally in males and females, and in the same proportion on either side. There is in some cases a family history of a predisposition to attacks of either trifacial neuralgia or sick headaches, and the symptoms of one or the other accompany the attacks of ptosis, which come on early in the attack of pain, but in only a very few cases is there accompanying anæsthesia. The attacks are usually ushered in suddenly, with neuralgic pains or headache, nausea and vomiting, which may be so light as to be thought absent; soon after, the paralysis of one or all branches of the motor-oculi appears, when all the symptoms except the pain may cease; after a shorter or longer interval (a few days to a few months) it disappears for a time, to be followed after a week's, month's, to a few years' interval by a recurrence. The attacks may be accompanied by photophobia, swelling of the lids, catarrhal or purulent discharge, paralysis of the other eye muscles, and, rarest of all, anæsthesia of any or all of the branches of the fifth cranial nerve. This latter symptom, in the five cases (including my own) in which it has occurred, has appeared on the same side with the pain and the oculo-motor paralysis; in two cases involving the supraorbital branch of the fifth nerve only; in two cases both that and the infraorbital branch; and in one case all the sensory branches of the fifth cranial nerve on the affected side. One, of course, at first naturally suspects syphilis or tumor, but the previous history of attacks, or symptoms accompanying the attacks, with lack of history, or other symptoms of either of these diseases and their subsequent non-appearance, especially in the optic nerve, will serve to help differentiate these cases.

"The prognosis varies. In some cases the patient has recurring attacks of the same character at varying intervals; in others, the severity and frequency increases till in some the trouble becomes permanent, and yet in others the reverse has occurred—namely, less frequency and less severity, or again, less frequency and more severity. Of course, this will remain the condition while the etiology remains so obscure as it is and its treatment empirical and unsatisfactory. This consists in the treatment of the attack of neuralgia or migraine with quinine, arsenic, phenacetine or aconitine; then the paralysis soon after disappears unless, in a later attack, it may become permanent, usually when the patient has come to the years of adult life. In cases which are not typical and obstinate it is well to try anti-syphilitic treatment, as they may be due to that diathesis or to commencing tumor."

After disscussing the different views, Knapp sums up the pathology of this disease as follows: "The most tenable hypothesis is that recurrent motor-oculi paralysis is due to some vascular change, inflammation, or œdema in a focal lesion, involving the root of the third nerve. As the œdema or exudation subsides, the conducting power of the nerve is wholly or partly restored and the paralysis disappears. In some cases the lesion may involve several nerves or the exudation may affect only a part of the lesion, involving different nerves at different times. As the lesion progresses, it may finally affect the nerve so far as wholly to destroy the conducting power, leading to permanent and total paralysis. The few (three) reported autopsies confirm this hypothesis."

Some Remarks on the Conservative Treatmont of Certain Prolapses of the Iris.

KNAPP, HERMAN, M. D., New York. (*Arch. of Ophthal.*, Jan., '97.)

"For many years my attention has been aroused by the white clean scars at the periphery of the cornea to which a portion of the iris is attached—the well-know adherent leucoma. The level of the cornea is unchanged, the eyeball tension normal, the pupil pear-shaped, but clean and mobile, the sight good, and the eye free from irritation. Not all adherent leucomas are so harmless, but the harmless ones are very numerous. They are the end-stage of a penetrating wound, or a perforating ulcer of the cornea, healed without infective inflammation. The ulcers may, however, have been the consequence of an infective inflammation, for instance of pustular keratitis or blennorrhoic conjunctivitis, but the infection, in these cases, did not penetrate into the interior of the eyeball. I have long made it a point in prolapses of this kind not to touch the protruding iris, for it plugs the gap and thus prevents the contagium from entering into the interior of the globe. I have even seen cases of blennorrhoic conjunctivitis in which a considerable portion of iris, lying in a crescentic corneal ulcer of the lower or upper periphery of the cornea, was afterward drawn back into the anterior chamber. The perforation healed with a grayish-white scar, but the pupil became central and round again. These cases are exceptional. The majority heal with an adherent leucoma without serious consequences, others become ectatic and produce glaucoma, others again lead to panopthalmitis. The latter unfortunate termination, as far as my experience goes, is favored by interfering with the prolapse, be it by cutting or cautery. I have, therefore, *made it a rule never to cut or burn off protruding iris in any infective conjunctival or corneal disease.* I treat the original disease, instil atropine in moderate quantity to keep the pupil dilated as far as possible without irritating the conjunctiva and producing granulations, and I cleanse the conjunctival sac with a mild antiseptic solution, for instance, chloride of sodium (chemically pure) 0.40 to 60.00 grams.

Having for years carefully watched the healing process of perforating corneal wounds I venture to put myself on record with the statement *that I do not remember a single case of sympathetic ophthalmia from any kind of prolapse, if the iris had not been wounded by an accident or by the hand of the surgeon.* This statement I beg, however, to consider as personal, for I am only one observer, and the experience of others may differ. In favor of this assertion are certain bacteriological observations which, in the winter of 1885 and 1886, I made in Koch's laboratory in Berlin, and later in my own in New York. While studying the action of pathogenic bacteria on perforating wounds of the cornea, especially in cataract sections, I noticed that the corneal tissue adjacent to the wound was densely infiltrated with staphylococcus pyogenes, whereas the tissue of the prolapsed iris was free from them. Guided by these principles I have for a long time been conservative in the treatment of iris prolapse, too conservative, probably, in one particular field, the iris prolapse following cataract extraction. The prolapses in this field very rarely occasioned the loss of the eye by inflammation, but frequently larger prolapses caused such a disfigurement and so high a degree of astigmatism that the results of the operations left a great deal to be desired. During the last years I have, therefore, made it a routine practice to inspect every eye a day after the extraction, be there any irritative symptoms or not, and abscise the iris, if prolapsed, at once, provided there be no septic inflammation. In this way the protruding iris can mostly be removed cleanly, *i. e.*, without incarceration of the limbs of the coloboma. My associate at the New York Ophthalmic and Aural Institute, Dr. R. O. Born, has dealt with iris prolapse after extraction in the same manner longer than myself. The management of the prolapse is, in fact, only the application to cataract extraction of a general rule long known and followed by my many ophthalmic surgeons, viz., excise the iris when it is still possible to make a clean iridectomy.

To *restrict this general rule is my chief object in writing this communication* Whenever a case came under my care in which I could expect that there would be no inflammation, and the prolapsed portion of iris small or large eliminated by nature, I treated the case expectantly as long as no threatening symptoms appeared. This was particularly my rule when the injury did not involve the lens. I have treated in this way not only the prolapsed iris, but also the ciliary body."

Dr. Knapp then gives the histories of two illustrative cases, the first presenting a wound through the whole breadth of the cornea with extensive prolapse of the iris—perfect recovery; the second presenting a large perforating wound of the upper lid and sclera, with prolapse of vitreous and ciliary processes—perfect recovery. Concerning these cases he says: "The first case demonstrates that conservative treatment of the prolapse of the iris through the cornea may produce results that could not be surpassed, if at all equalled, by any operation. If the latter have the advantage of healing the wound more quickly I would say that, to me at least, the conservative treatment appears safer and cleaner. It is notable that in seven years the astigmatism had increased from 1 D to 7 D, showing the contraction of the extensive scar.

"The second case is an example of the fact that clean perforating wounds of the sclerotic commonly heal kindly, whereas prolapses of the ciliary processes, like prolapses of the iris in the ciliary region, are apt to produce cyst-like ectasias, which for their cure require thorough excision."

Gumma of the Ciliary Body.

CARGILL, L. VERNON, F. R. C. S., London, Eng, (*British Med. Journal*, Jan. 2, 1897.)

A typical case of this rare affection is recorded, the history and cause of the disease being given. The following remarks are added:

"In this case, as is usual, there was a preceding iritis, and a history of rapid deterioration of vision. The gumma appeared ten months after the initial lesion, but in a case reported by Terson scarcely two months elapsed; while in the cases recorded by Panas and Scherl there was an interval of fully seven years. In this case, as in Highet's, vigorous treatment was attended by a remarkably good result, the gumma cicatrising without breaking down, perforating and discharging. The prognosis in this affection is very grave, the eye generally, in spite of all treatment, becoming soft and shrunken, with atrophied iris, closed pupil, detached retina, and consequent complete and permanent loss of vision. There is an interesting paper by Albert Terson in the *Archives Generales de Medecine*, October, 1894, in which he calls attention to the necessity of distinguishing these rare cases of primary gumma of the ciliary body from the much commoner and well-known cases of affection of the ciliary body, in association with and secondarily to iritis condylomatosa, or papulosa. Terson also points out the liability of mistaking for this early tertiary affection: (1) An intra-ocular tumor—for example, sarcoma of the ciliary body, growing outward: and (2) any conjunctival, sub-conjunctival, or episcleral neoplasm, particularly if syphilitic. In sarcoma of the ciliary body the growth is usually slower, and there are often attacks of increased tension, the tension in the case of a gumma being usually low. In Highet's case, however, the tension was +1 for fully a month. Nitot, in his *Thesis* (Paris, 1880), says that: (1) 'Every malignant tumor of the ciliary body in a manifestly syphilitic subject should be regarded as a ciliary gumma, and that (2) every malignant tumor in a subject exempt from acquired or inherited syphilis is probably a ciliary sarcoma, or a tuberculous affection.' The possibility of a cancerous tumor appearing in a syphilitic subject, and the impossibility of always obtaining evidence of syphilis must, however. always be borne in mind. If, therefore, there is good reason for doubt as to the nature of the growth, and if, moreover, vigorous anti-syphilitic treatment does not very soon arrest the progress of the disease, then it would seem most discreet to perform enucleation of the affected eye promptly."

On Certain Apparently Organic Tumors of the Orbit Which Disappear Under Medicinal Treatment.

SNELL, SIMEON, F. R. C. S., Edin., Sheffield, Eng. (*The Lancet*, Jan. 23, '97.)

"I have for a long time been familiar with the clinical fact that internal medication can, in certain cases, bring about the disappearance of orbital tumors. This is true, moreover, of tumors which exhibit features rendering differentiation from those of a malignant or certainly organic nature difficult, and but for the effects of treatment the distinction would, perhaps, be impossible without an examination of their minute structure. Just now I am thinking particularly of orbital growths occurring at about the middle period of life when those of a malignant nature would be prone to arise.

"Panas, of Paris, at the annual meeting in London of the British Medical Association in 1895, brought forward a very valuable and instructive paper dealing with pseudo-malignant tumors of the orbit. He expressed the opinion that because dispersion of these growths followed the administration of the iodide of potassium it was a mistake to regard syphilis as the only cause, and he believed that a 'number of neoplasms thought to be lymphomas, sarcomas, or syphilomas, ought to be attributed to the dyscrasia produced by some toxin.' He spoke of a class of infectious tumours, the syphilitic being an example, but not the only one. We are, of course, all familiar with the frequent impossibility of getting a specific history even in cases which admit of little doubt of syphilitic taint * * * But Panas' observations are, nevertheless, of interest as he recounts instances which have undergone apparent cure with treatment by arsenic and other remedies which can hardly be regarded as antisyphilitic."

Mr. Snell then gives the histories of three cases occurring in middle-aged individuals: "The cases mentioned bear a very close clinical resemblance to tumors regarded as sarcomatous and in which the diagnosis has been confirmed by the microscope after the growth has been removed. There was the same evidence to the touch of a somewhat hard, elastic tumor, not flucutating or pulsating, and somewhat nodular on the surface as an organic tumor would present. Treatment proved that they could be dispersed without operation, and therefore it appears to me that the lesson to learn is one that Panas enforced in the paper to which I have already directed attention—*viz.*, that before resorting to surgical measures for orbital tumors, the effects of internal treatment should be tried. It is not necessary that iodide of potassium with or without mercurial inunction be employed, for Panas mentions the benefit derived from arsenic and other remedies. Panas also suggests that serum, according to the nature of the infection which has been at work, should be used.

The simplest way of accounting for the presence of such tumors as I have referred to is, of course, to presume that they are syphilomas and very naturally to discount the absence of specific histories. If we are to believe that, as a consequenc of dispersion following the administration of the iodide, the nature of the tumour has been proved. nothing more, of course, can be said. I confess, however, that my feeling is that such tumors as have been referred to in this short communication are not necessarily syphilitic, and that the observations of Panas as to unilateral and bilateral orbital growths afford strong support to such a contention."

A Contribution to the Study of Molluscum Contagiosum of the Eyelids.

MUETZE, H., Dr., St. Louis. Mo. (*Archives of Ophthalm.*, Jan. '97.)

The writer gives the histories of a number of examples of this disease with full histological examination. He arrives at the following conclusions as the result of clinical and microscopical study:

(1) "Molluscum contagiosum of the lid, or the margin of the lid, is not rarely the cause of conjunctival catarrh. (2) Molluscum contagiosum is undoubtedly contagious. (3) The molluscum corpuscles are to be considered the product of a peculiar degeneration of the epithelial cells, caused by the contagium. (4) The degeneration begins in the protoplasm of the cell itself and not in the nucleus of the cell."

The Operative Treatment of Pterygium.

BOECKMANN, EDUARD, M. D., St. Paul, Minn. (*Journal of the Am. Med. Assoc.*, Jan. 16, '97.)

The writer believes pterygium to be "a dislocation of a certain part of the conjunctiva over the cornea, dependent upon a localized episcleritis, in all probability due to an infected foreign body, which has penetrated the subconjunctival tissue and which is expelled at the apex of the pterygium, whereupon the latter becomes stationary." He describes his operation of reposition and fixation which he has employed for nearly fifteen years, and which has given him eminent satisfaction:

"Reposition: The head of the pterygium is grasped with a good forceps and it is carefully dissected from its corneal attachment either by scissors, knife, or evulsion. It must be dissected to its full extent and even a little beyond; after this dislocated conjunctiva is unfolded by putting it on the stretch which is affected by placing the blades of the scissors underneath it and lifting it away from the globe. After this the conjunctiva will contract somewhat from the corneal periphery and assume its anatomical position as nearly as possible.

"Fixation: In order to effect this properly we must recognize as a fact, that a *sine qua non* for the establishment of pterygium is the existence of the sub-conjunctival connective tissue. This is, indeed, the medium which makes it possible for the conjunctiva to slide over the cornea; if it did not exist, if, in other words, the conjunctiva around the cornea was intimately connected with the sclera, a pterygium would be an impossibility. If we remove the sub-conjunctival tissue to an extent that the edge of the replaced conjunctiva is freed therefrom and brought into direct contact with the sclera itself, a solid adhesion between the two will result and a successful fixation established. With one forceps, therefore, the conjunctiva is lifted up near its junction with the corneal margin (above or below) and with another forceps the sub-conjunctival tissue is dragged forward, and, steadily pushing the conjunctiva back, a good sized band of connective tissue is removed with the scissors along the whole extent of the conjunctival edge. If there is active episcleritis we do well to remove all inflamed tissue as good practice for the cure of the episcleritis itself and as additional safe guard against the possibility of a relapse. After the excision of the sub-conjunctiva, the conjunctiva will retract further backward, whereupon the whole wound, scleral and corneal, is thoroughty scraped and scarified for inflammatory remnants with a cataract knife. The hyperplastic conjunctival edge is trimmed off. To secure the conjunctiva in position, until adhesion is firm, and to prevent it from sliding over the cornea again by the movements of the eye, I fasten the edge to the internus (externus) muscle at its insertion with a single fine catgut suture and the act of fixation is complete. We have now a triangular wound outside the cornea, the free edge of the cut conjunctiva in direct contact with the denuded sclera, and a fresh corneal wound extending to Bowman's membrane. Cicatrization will follow rapidly from all sides and by virtue of this cicatrix a recurrence of the dislocation will be prevented for all time.

"The after-treatment is extremely simple. The eye is occluded with a folded sterilized gauze; the bandage is changed daily and a two per cent. solution of nitrate of silver applied to the conjunctiva for a week; the bandage is then removed and the patient discharged."

Eucaine Hydrochlorate. A New Anæsthetic.

JENNINGS, J. ELLIS, M. D., St. Louis, Mo. (*Am. Journal of Ophthalm.*, Dec., '96.)

After describing the experiments of Dr. G. Vinci with the local anæsthetic, the writer gives the results of his own experiments with a two per cent. solution on normal eyes and on cases where a local anæsthetic was indicated: "It was used before making applications of silver and copper to the conjunctiva of the lids, cauterizing corneal ulcers, removing foreign bodies, operations for chalazion, ectropion, etc. In the normal eye the first drop instilled caused some smarting, burning, lachrymation, and slight hyperæmia of the entire conjunctiva. In diseased eyes these symptoms were more marked. The smarting disappears at the end of two or three minutes when, if a second drop is instilled, the smarting returns, but to a lesser degree. The anæsthesia begins in from three to five minutes, and lasts from ten to fifteen minutes. According to Vinci, the anæsthesia began in the cornea and spreads thence to the conjunctiva. I agree with Berger that it begins at the point where the drop first touches the mucous membrane and lasts longest there. The hyperæmia is slight in some cases, more marked in others, and persists usually for about half an hour. Vinci states that eucaine does not induce mydriasis, and that the pupil reacts normally to light. I made a careful test on a normal eye with the following results: Before instilling eucaine the right pupil of the patient measured 5 m.m., the left 4½ m.m.; both reacted promptly to light. I then instilled one drop of eucaine into the left eye, and five minutes later a second drop. During the anæsthetic stage, the left pupil was not affected as regards size and reaction to light. But when I next looked at the eyes, an hour and a half after instillation of the first drop, the right pupil still measured 5 m.m., *while the pupil of the left, or eucaine eye, had dilated from 4 1-2 to 6 m.m.* The right pupil reacted promptly to light, *while the movements of the left were markedly sluggish.* These results differ from those of Vinci, but while it is true that eucaine effects the size and movements of the pupil, this is less marked than after the use of cocain. No disturbance of accommodation was observed, although it is reasonable to suppose that more extended experiments will show a slight loss of accommodative power corresponding to the effect on the pupil. I examined the cornea carefully to note the effect of eucaine upon its epithelium. There was no loss of luster, no dryness or exfoliation of corneal epithelium as is observed after use of cocain. In the various operations in which eucaine was used, it was found equal to cocain in rapidity of action, duration and intensity of the anæsthesia. It will thus be readily seen that eucaine is a valuable addition to our list of remedies, and deserves to rank with cocain as a local anæsthetic. It is superior to cocain in that it does not decompose when kept in solution, can be rendered aseptic by boiling, is less poisonous, has but a slight effect on the pupil, causes no disturbance of accommodation, and has no effect on the corneal epithelium. The smarting and conjunctival congestion caused by eucaine is certainly an inconvenience, but should not prevent our preferring it to cocaine in operations where the absence of mydriatic effect is of especial importance."

The Use of Cicatrical Skin-Flaps in the Operation for Ectropion.

WILSON, HAROLD, M. D., Detroit, Mich. (*Arch of Ophthalm.*, Jan., '97.)

The writer commences his article with a quotation from De Wecker that "blepharoplasty is one of those operations in surgery in which more work has been done with the pen and pencil than with the bistoury." He maintains that although the general belief that scar tissue should not be included in skin-flaps is often justified, this must not be laid down as a general rule. He cites the views of a number of authorities and concludes with the following propositions based upon a summary of all the factors involved in the problem studied:

"*The use of pedicellate flaps constitutes the method of choice:* (1) When the cicatrix is confined to the lids, the surrounding parts being normal. (2) When the cicatrix involves not only the lids, but also the surrounding parts, and has the qualities necessary for successful transplanation. (3) When the cicatrix involves not only the lids, but also the surrounding parts, and although not of good quality for plastic purposes, can be rendered so by prolonged preliminary massage.

The use of skin-grafts (preferably those of Thiersch) constitutes the method of choice. (1) When the cicatrix involves not only the lids, but also the surrounding parts, and neither has the necessary qualities for plastic purposes, nor can be made to assume them by treatment. (2) For the relief of secondary defects (either fresh or granulating), left after the performance of a plastic operation, or after the removal of malignant neoplasms.

It is a fair conclusion, I believe, from what has been shown above, that "the general belief that scar tissue should not be included in skin-flaps" is an error, and that under many circumstances it is the very material to be selected above all else for attaining the best results. Its employment requires experience, discrimination, and judgment. Its use is often improper, but it does not therefore deserve a sweeping and universal condemnation. Hotz has shown how it may be put to excellent account from a mechanical standpoint, and the future experience of operators who do not consider it *declasse* on general principles, and who are willing to avail themselves of its valuable properties, will, I think, demonstrate its usefulness, and will give it a legitimate and established place."

Modification of the Usual Method of Mounting Specimens in Glycerine Jelly.

MARSHALL, DEVEREUX, London, Eng. (*Ophthalmic Review.* Nov., 1896.)

Mr. Marshall had frequently noticed much inconvenience arise from the comparatively low melting point of the glycerine jelly in which museum specimens are mounted; another objection was that the color of most of the jelly was distintly brown. He recommended the following method as producing jelly which was only slightly colored: Cut up 30 grammes of best French gelatine and allow it to soak in 240 c.c. of cold saturated solution of boracic acid (made by dissolving boracic acid in boiling distilled water). Add 80 c.c. of glycerine and the white and shell of one egg. Heat this in a water bath, and when the albumen was being precipitated add 1 c.c of glacial acetic acid. Boil for several minutes and filter through flannel; then again filter once or twice through filter-paper in a hot water funnel. In order to make this resist heat the following simple method was adopted: Pour a sufficient quantity of the melted jelly into a test tube containing some formol in the proportion of 3 or 4 minims of the latter to a drachm of the former. Thoroughly shake together and proceed to mount the specimen in the usual manner. The jelly does not undergo any alteration in appearance by the addition of formol, nor does it show any additional tendency to set more quickly. But after 24 to 48 hours it will be found to have become quite incapable of being again melted by any amount of heat. It can be raised to any temperature or held in a test tube in a Bunsen flame until heated to boiling point, and yet it will not melt. Water may be boiled on its surface without any change whatever taking place in the solid mass of jelly. If less gelatine is used, a still whiter jelly can be produced, but it is not so firm; even then, however, it still failed to melt with heat after the addition of formol, but possibly after a time this thinner jelly might shrink, whereas the other certainly does not. This would be most useful to those who wish to have permanent preparations, even if they resided in very hot climates. Dr. Wilder, of Chicago, has recommended exposing the surface of the jelly to the action of formol, but the author preferred mixing it as above described.

ABSTRACTS FROM RECENT FRENCH AND ITALIAN OPHTHALMOLOGICAL LITERATURE.

By Casey A. Wood, M. D.,

CHICAGO.

Subconjunctival Injections of Sublimate in Infective Irido-Choroiditis and Migratory Ophthalmia.

Although the observations made by Addario[*] are based upon an experience with few cases, the report is carefully prepared and the subject has been well investigated. His conclusions are as follows: (1) The infective forms of chronic irido-choroiditis are least benefited by subconjunctival injections, and they require numerous and repeated treatments. (2) The acute forms, on the other hand, respond immediately to this form of medication, the diseased process being rapidly stayed. (3) Organized products of the inflammation (fibrinous exudates) in irido-choroiditis mostly disappear if the disease be acute in form, and they often undergo shrinkage even when of long standing. (4) A threatened attack of sympathetic ophthalmia, from an infective irido-choroiditis of the opposite eye, may be prevented by the early use of subconjunctival injections. (5) An active sympathetic ophthalmia, even after the enucleation of the wounded eye, does not readily respond to treatment by injection, but when a partial disappearance of the plastic exudation is accomplished it indicates a return of vision more or less useful.

C. A. W.

Hydatid Cyst of the Orbit with Papillitis.

Varese gives an interesting account[†] of this rare parasitic cyst. He speaks of the difficulties of differential diagnosis between echinococcus cyst and other tumors of the orbit, the symptoms being practically the same in the early stages of each; exophthalmus, deviation of the globe, diplopia and lowering of vision. The limited number of reported cases is characterized by neglect upon the part of the observer, in almost every instance, to state how he came to a conclusion, before cutting down on the tumor, that he was dealing with an instance of orbital hydatids. A few have noted the fact of defective vision without attempting an explanation of it. Sorge, Mules, Isekutz and Sharp examined the fundus and reported atrophy of the optic nerve. Valude and Terson found edema of the papilla, while Dieu discovered inflammatory changes in the neighborhood of the cyst wall. Probably this last process was the cause of the swollen papilla noticed by Valude and Terson. Indeed, in view of the history given by each reporter, edema of the papilla or neuritis optica may be more constant in hydatid cyst of the orbit than in other orbital tumors. If this be so it will be of some value in their differential diagnosis. Varese's case was that of a young woman, aged 15, who came to the clinic in March, 1895, suffering from prominence of the left eyeball and defective vision on the same side. She stated that about a month before she began to have intense left sided headaches, the pains being occasionally limited to the orbital region. With these pains the eye began "to swell," and kept on increasing in size until it had reached its present dimensions. During the last few days she had remarked a loss of vision in the left eye and had began to see double. The left globe is not only exophthalmic, but is directed downward and outward. The superior sulcus is obliterated, while the upward and downward excursions are especially limited. The bulbar conjunctiva is slightly vascular; the cornea is normal, the pupil is of the same size as its fellow and reacts to light and accommodation. The finger pressed between the superior orbital wall and the eyeball discovers an immovable tumor of elastic consistency situated in the depths of the orbit. This exploration produces slight pain without diminishing the size of the tumor. There is crossed diplopia in all parts of the field, the false image being above the true and a little inclined to the right. With the ophthalmoscope the papilla appears swollen, red and with dirty-gray, indistinct margins. The veins are turgid, and in places quite tortuous. The macula and other portions of the retina are normal. $V=\frac{1}{3}$. Tn. The right eye is entirely normal. Prof. Angelucci made an exploratory incision along the upper sulcus, about 2½ c.m. long, and with his finger found that the elastic body was adherent to the superior-internal wall of the orbit. During the exploration he broke down the cyst wall and the swelling entirely disappeared. The next day the eyeball was in its normal position and its movements became normal in all directions. Vision improved to $\frac{2}{3}$ and the edematous condition of the background was less marked. A year afterward the patient returned with practically the same symptoms, except that vision was about the same as when last examined. Angelucci made an incision similar to the first one, 3 c.m. long, opened Tenon's capsule and introduced a grooved sound alongside his finger and carefully enucleated a cyst about the size of a pigeon's egg. The tumor was found to be full of a limpid liquid and of daughter cysts. A careful microscopic examination of the fluid failed to discover any hooklets, but a nitrate of silver solution threw down a heavy deposit of chlorides. The cyst wall was of an opalescent-white color, easily torn and composed of distinctly amorphous layers—characteristics common to all the forms of hydatids. C. A. W.

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[*] C. Addario Le iniezioni sottocongiuntivali di sublimato nelle irido-coriodditi infettive e simpatiche. *Archivio di Ottalmologia*, Anno 4. Fasc. 7–8, 1897.

[†] P. M. Varese. Cisti di echinococco dell orbita con papillite. *Archivio di Ottalmologia*, Feb. 1897, p. 266.

Tenonitis.

PROF. PANAS, of Paris, in a clinical lecture delivered at the Hotel Dieu (*La Semaine Medicale*, Feb. 5, 1897), gives his views on tenonitis, as follows:

Quite a number of different affections has been classified under the name, such as suppurating, syphilitic, spontaneous and traumatic tenonitis, and even general inflammation of the orbit. Like arthritis, tenonitis has become a generic term, and has been made to include such dissimilar varieties as the dry, that with effusion of liquid, the rheumatic, the tubercular, the gonorrhœal, etc.

In order to understand fully the symptoms of tenonitis, and the order of their appearance, it should be remembered that Tenon's capsule is a fibrous, funnel-shaped cavity, purely cellular toward the back, traversed by the tendons of the six motor muscles of the eye, to all of which it supplies a complete sheath. These sheaths gradually spread out and enlarge at the insertion of the tendons into the sclera, and merge together around the cornea and there unite solidly with the sclera on one side and the conjunctiva on the other. The inter-tendinous diaphragms as they proceed backward gradually become thinner, and are finally lost in the laminar tissue which surrounds the globe and constitutes its sliding bursa. It is through these diaphragms that the sub-tenonian cellular tissue communicates with the subconjunctival cellular tissue, forming the passage-way for the serous fluid which gives rise to chemosis in tenonitis. The capsule is essentially a conjunctival bursa, the function of which is to facilitate the movement of the eyeball, and the ocular apparatus becomes a true articulation, belonging to the group of the enarthroses.

The first authors who described tenonitis located the inflammatory process in the fibrous tissues of the walls of the orbital cavity; hence, the term *capsulitis* employed by de Wecker. This is an anatomical error, as inflammation of fibrous tissue is very uncommon. Tenonitis is no more an inflammation of Tenon's capsule than hydrarthrosis of the knee is an inflammation of the capsule of that joint. In the latter case it is the synovial membrane that is affected; in the former, it is the fine trabecular tissue which "exists in front of the capsule, at the back of the sclerotic membrane"—the retro-ocular bursa.

Tenonitis is defined, therefore, as "hydrarthrosis of the eye," or "hygroma of the retro-ocular bursa," or "articulation." It is a purely rheumatic phenomenon, of the same order as hydrarthrosis, hygroma, and tendinous synonitis, except in those very rare cases in which it occurs in the course of certain pyrexias, or as a result of tenotomy.

As a rule, tenonitis begins suddenly in one eye, and two or three days later the second eye is implicated, and on the third or fouth day the disease is fully developed. The first symptom noticed is intense peri-orbital pain, coming on in "fits." Then is added a sense of pressure, of fullness of the eye, a bearing-down sort of pain, which seems to have its seat in the bottom of the orbital cavity. Every movement of the eye is painful, and the patient accordingly keeps the eye closed and motionless. Inspection shows nothing abnormal till on the second, or possibly the third day, when two "capital symptoms, quite pathongnomonic" appear, viz., slight exophthalmos and chemosis. The exophthalmos, although not marked, has been observed in all cases, and sometimes excites unnecessary alarm. The chemosis begins in the lower retro-tarsal fold and is accompanied by marked puffiness of the lower lid. It shows itself first as large yellowish blebs of the conjunctiva, which gradually enlarge until they surround the whole cornea, forming a sort of ridge around it. This protrudes more or less, and sometimes, being strangled by the eyelids, becomes dry, red and inflamed. But usually there is no inflammation, no mucus or muco-purulent secretion, and the conjunctiva is barely red from the compression of its vessels. The sharpness of vision is, as a rule, unimpaired, but there is sometimes diplopia. The ophthalmoscope shows slight hyperemia of the retina.

The disease is of short duration, and within five or six days, sometimes earlier, there is complete subsidence of all the alarming symptoms. Occasionally two or three attacks succeed one another before final resolution is effected.

From anatomical considerations it may be understood "why inflammation of the retro-globar bursa, with slight effusion, first of all gives rise to compression of the ciliary nerves, pain and impaired movements of the eyeball; the effusion, if more abundant, determines a degree of exophthalmos, and then the liquid, filtering through the tendinous sheaths, finally rises beneath the conjunctiva and produces chemosis; at the same time the tendons of the muscles themselves, being immersed in the fluid, become inflamed by contiguity and slightly distended, all movement being extremely limited and only to be performed at the cost of acute pain. If very abundant, the effusion may even compress the vorticinal veins, and thus induce stasis in the retina." The exophthalmos cannot go beyond a certain point, as too large a quantity of liquid in the retro-ocular bursa will tend to filter into the cellular tissue of the orbit and beneath the conjunctiva.

The treatment is both local and general. Locally, hot compresses with an effusion of elder may be applied during the day and warm cotton-wool dressing at night. Constitutionally, the pain should be soothed by antipyrin, either alone or combined with quinine sulphate, or by chloral: and the rheumatic condition should be treated by sodium or lithium salicylate. A. A. Hubbell.

Retinal Changes in the Graver Forms of Malarial Poisoning.

Lodato has reviewed an article by Guarnieri* in the April '97 issue of the *Archivio di Ottalmologia* on the lesions of the retina found in 10 persons dead from pernicious fever—mostly of the comatose type. The alterations discovered were numerous and constant in almost all the

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*Guarnieri. Ricerche sulle alterazioni della retina nella infezione acuta da malaria. *Archivio per la Scienze Mediche*. No. 1, 1897.

cases. They were chiefly swollen arteries and veins, injected capillaries and perivascular edema. In the graver forms of the infection there was also marked swelling both of the papilla itself and of the peripapillary zone. In the blood of the retinal vessels were found the well known changes in the red corpusles characteristic of the disease. The author has also noticed retinal hemorrhages which did not appear to involve the bacillary layer. There were very few leucocytes in the retinal capillaries, but these were numerous in the larger veins. The endothelium of the retinal vessels, as well as the protoplasm they contained, were infiltrated by fine pigmented granuals. Guarnieri further remarks that, in consequence of the stasis and edema, it is probable that the nervous elements of the retina always undergo changes even though the alterations are not sufficiently pronounced to be revealed with certainty by the ordinary straining methods. The retinal changes discovered by the author explain most of the visual disturbances complained of by patients suffering from malaral fever, or at least those disturbances that are temporary and amenable to treatment.

C. A. W.

ABSTRACTS FROM CURRENT NEUROLOGIC LITERATURE,

By Wendell Reber, M.D.

The Occipital Lobe and Mental Vision.

Soury, J. Brain, Autumn, 1896 (from *Revue Philosophique*, January, February and December 1895; February and March 1896).

These articles, investigating comprehensively the relations of the retina, the optic path. and the occipital lobe to the completed visual act, comprise the best short summary of our knowledge of this subject that we have seen. The author treats his theme under two heads. He follows the path of the visual impression first from the retina to the primary sub-cortical centers, and second, from the primary optic centers to the cortex of the occipital lobe (the calcarine region and cortical retina). Concerning the intimate construction and physiology of the optic nerve, he says, "the optic path as a whole runs from retina to cortex, but contains two parallel systems of conductors (a) centripetal, (b) centrifugal in direction (Ramon y Cajal). The former arise in the axis-cylinder prolongations of the large cells of the retina. They aborise freely with the protoplasmic expansions of the principal groups of nerve cells in the external geniculate bodies and pulvinar of the optic thalmus. From the intercallary cells of these ganglia other axis-cylinder processes traverse the posterior end of the internal capsule, continue as the white sagittal substance (or optic radiations of Gratiolet). and end in the nervous feltwork of the fifth (and third) layer of the occipital cortex. There a new system of neurons forms connection with the other cells of the cortex, more particularly with the giant solitary cells.

The centrifugal fibers start with the axis-cylinder processes of the pyramidal cells of the cortex, and arborise with the nerve cells of the superficial gray matter of the anterior quadrigeminal tubercles. The processes from these ganglia again terminate in the norvous feltwork of the retina. The giant solitary cells of the occpital cortex are found to atrophy after section of the posterior segment of the internal capsule.

Clinical evidence shows that lesion of the anterior quadrigeminal bodies is not essentially injurious to vision, but that it does involve disturbance of the eye movements and of pupillar innervation, (Monakow). In the lower animals, even in certain mammals, these ganglia are of main importance to vision, as compared to the external geniculate bodies and pulvinar of the thalmus. The fibers which they contribute to the optic tract in man are relatively insignificant, though the iridic reaction appears to be governed by these bodies. Mendel's detailed experiments point to the ganglion habenulæ as the precise center of the pupillary reflex. Iridectomy seems to invariably produce atropy of this ganglion. M. therefore defines the path of the reflex as optic nerve and ganglion habenulæ of same side, thence by posterior commissure to nucleus of Gudden and so to the fibers of the oculomotor trunk.

The visual acuity of the macula is said. by Soury, to depend upon the delicacy with which each cone transmits its excitation to a bipolar cell, this again to one protoplasmic arborisation of the ganglionic layer. The autonomy of the macular region persists throughout the optic nerve to the cortical centers: and the preservation of central vision in the majority of cases where (as in hemianopsia), the entire visual cortex is destroyed on one side indicates that each macula is connected with both hemispheres. The importance of the sub-cortical centers must be remembered. They are the ganglia of origin for the optic nerve—the posthouse where impressions conveyed by the retinal fibers are transmitted to other couriers.

In regard to the cortical center of vision, M. Soury adopts the position of Henschen, stating that the visual area is much more extended than the centers for sensations of light and color. Late anatomical methods have thrown more light on the functions of the nerve centers. Thus it has been shown that in cases of blindness involving widespread degenerations the geniculate bodies alone are in direct relation with vision. The fibers of the optic nerve which pass into the pulvinar of the thalmus, the anterior quadrigeminal bodies and the temporal and the parietal lobes are not visual.

Degeneration of the pulvinar produces no hemianopsia when the geniculate body is intact. The anterior quadrigemina may submit to grave lesion without any disturbance of vision. The pulvinar and quadrigeminal bodies are possibly reflex optic centers—in man they probably do not contain a single visual fiber. The geniculate bodies alone are in relation with vision, lesion of them invariably producing hemianopsia. Certain forms of sub-cortical hemianopsia may indeed be accompanied by pulvinary lesion, but the latter is not causative, it is only coincidental. The actual cause of blindness is lesion of the external geniculate body. Destruction of this ganglion determines an almost total disappearance of the bundle of Gratiolet, through which pass the visual fibers from the ganglion. The symptoms which originate from the thalmus are quite different, *e. g.*, motor troubles of expression—imitative, involuntary, automatic, etc. In man, the anterior quadrigeminal tubercles are equally deprived of the importance which Griesinger attributes to them in vision. In fact, the optic lobe in man is no more than a reflex center. Nor has the inferior parietal lobule or angular gyrus any more direct relation with vision.

The anatomical structure of the calcarine cortex (though differing from the rest of the occipital lobe, not merely in the thickness of the molecular layer, but also in its development of horizontal fibers forming the band of Vicq d'Azyr.) is not special to the fundus of the fissure. The same extends for several m.m. along the two lips of the calcarine fissure, the superior of which belongs to the cuneate, the inferior to the lingual lobe. It is to be expected that such identity of structure in either convolution should result in identity of function, and Hun adduces a case in which atrophy of the superior lip of the calcarine fissure produced hemianopsia of the inferior quadrant of the visual field on both sides. Wilbrand shows that the lower lip corresponds with the upper visual field. There would thus appear to be projection of the retina upon the cortex of the occipital lobe, as contended by Munk and disputed by Monakow. Henschen accepts it and proposes the name of "calcarine retina" for the part of the cortex of this fissure at which, according to him, there is a projection of the elements of the pheripheral retina, via the visual fibers of the optic nerves chiasm, tracts, and optic radiations. The macular bundle, though lateral in the papilla of the optic nerve, is certainly central in the chiasma and tract. The central and peripheral portions of the cortical retina would lie in the anterior and posterior parts of the cortex of the calcarine fissure (Henschen).

Sachs, on the other hand, has a case which does not correspond with this somewhat restricted cerebral localization of the macula lutea. Both Henschen and Wilbrand believe that each half of either macula lutea is in connection with both cerebral hemispheres, while the macular fibers also undergo partial decussation in the chiasma and are divided into direct and crossed bundles.

The preceding observations refer to the "cerebral retina," and not to the much larger region of the "visual area," which is the anatomical substrate of mental vision. While the region on which visual impressions are projected is very limited, that corresponding with visual representations is vast, and may very likely involve the convexity of the occipital lobe and the angular gyrus. The seat of perception and of representation occupy distinct positions on the occipital and parietal lobes. Nothing is certain, however, beyond the fact that there is a cortical center of visual perception, and that its lesion entails cortical hemianopsia.

Soury joins Monakow in emphasizing the importance of the primary optic centers interposed on the optic path, such as the external geniculate body (in which the majority of the visual fibers terminate and lose their individuality), a fact too often overlooked in schemata, which are constructed as if the projection bundles radiating over the visual sphere were the direct prolongation of the optic fillets. This has important bearings upon the doctrine of retinal projection *(supra)*. The anatomical conclusion appears to be that not the retinal fibers, but the fibers of the external geniculate body are projected upon the occipital lobe. Soury and Monakow disallow the direct localized projection of impressions from the macula lutea on the cortex, Soury's theory being that the macular fibers are distributed to all parts of the external geniculate body, and thus transmit their impressions to every part of the cortical center. This would account for the partial presevation of central or macular vision in most cases of cortical hemianopsia.

M. Soury concludes from all these facts relating to the cortical localization of bilateral homonymous hemianopsia, that Ferrier is mistaken and Munk correct in their respective views concerning the cerebral center of vision. Munk attributes the transitory hemianopsia consequent on the extirpation of the angular gyrus to the inflammatory reaction of the occipital lobe, and especially to the compression (not destructive lesion) of the optic radiations of Gratiolet and Wernicke which pass under the angular gyrus and inferior parietal lobule on their way to the cortex from the external geniculate bodies. It is thus that all lesions of the angular gyrus, etc., usually reach the projection bundle of the visual fibers. Should this be destroyed and the message thus interrupted from the last sub-cortical station to the occipital cortex, nothing can avert absolute cortical, hemianopic blindness in the two halves of the retina implicated.

Ophthalmoplegic Migraine.

Dr. d'Alche's scrutiny of neur-ophthalmic literature reveals reports of 25 instances of this disorder. First described in Germany, ophthalmoplegic migraine was then studied in France by Parinaud and Marie, and afterward by Charcot and Ballet. Charcot states that the malady is not an entity but a symptom complex, characterized by the presence of hemicrania with concurrent total paralysis of one of the oculo-motor nerves. The one sided headache is quite characteristic and is emphasized by the various writers. The intensity of the pain is seldom very great, but deep seated, continuous, and extending from the occiput to the orbit. Ocular paralysis, invariably unilateral and nearly always complete, follows the hemicrania. Characteristic also is the tendency toward periodicity of relapse, from 1 to 4 times yearly: in one case (Moebius), every August for 3 consecutive years; in another (Thomsen), bi-yearly. In the later stages the disease becomes more continuous. A typical attack presents, during the painful period, the same features as ordinary migraine (nausea, vomiting, photophobia, and hemicrania), to which may be added occasional edema of the lids and salivation. Abrupt in onset, the duration is quite variable. The paralytic period follows the pain, and gastric symptoms by several days, rarely weeks. The picture is that of complete third nerve palsy; drooping upper lid, and paralysis of both the extra and intra-ocular muscles. While the development of these phenomena is sudden, it is not so precipitate as in cerebral hemorrhage. The painful symptoms frequently continue for some time during the paralytic stage, but are less intense; a view opposed by Charcot, who considers the onset of the latter period as indicative of withdrawal of the former.

The palsies may last for hours or days, only to disappear as suddenly as they set in, the patient feeling as well as ever after the attack. New and similar attacks are always to be anticipated.

Eventually the malady takes on a chronic character (Thomsen's cases lasted 29 years). The paralytic attacks are rare but more tenacious, while the other symptoms persist in the inter-paralytic periods, giving the disease the character of a continous disorder with periodic exacerbations. The tendency is more toward aggravation than toward recovery, though spontaneous cure is possible. Treatment: Bromides, iodides (for circulatory disturbances), and electricity; the last especially when the ocular palsies threaten to be permanent.—*Journal Nervous and Mental Diseases, Jany., 1897—From Jour. de Med. et de Chir. prat., July, 1896.*

Discussion on the Pathology of Exophthalmic Goitre.

Murray, in opening the discussion (*British Med. Jour.*, Oct. 3, 1896), stated that the cause of the disease was to be found in the thyroid gland, and he knew of no case in which this was found normal after death. He compared the histology of the normal thyroid with the thyroid tissue in a state of compensatory hypertrophy, concluding "that in exophthalmic goitre there is an excessive formation and absorption of thyroid secretion which may or may not be normal in character; and that the symptoms of the disease are due to the presence of this excess of the secretion in the blood, and to its action on the tissues, and especially on the nerve centers in the medulla. The practical conclusion from which is that we shonld endeavor to timprove our methods of treating the diseased thyroid gland. We want to be able to induce a moderate degree of fibrosis, and so imitate the natural processes of recovery. Removal of a portion of the gland, though most successful in some cases, has proved to be dangerous in others. Possibly injections of iodine, electrolysis, or some similar means of starting a limited fibrosis, may help us to attain without danger the object we have in view."

Edmunds agreed that changes of the thyroid in exophthalmic goitre are practically identical with those found in a part of the gland that has undergone hypertrophy in consequence of removal of a large part of the gland. But this assent to Murray's position stops here. He concludes that the change in the thyroid is not the primary lesion. He believes that the disease cannot be due to hypersecretion of normal thyroid juice, for in this case there would be no occasion for compensatory hypertrophy; and he thinks that there are well founded objections to the argument that because myxedema is due to decrease of thyroid secretion, exophthalmic goitre must be due to increased secretion. These objections are: That although there is a sharp contrast between the chronic forms of myxedema and Graves' disease, they present greeat similarity in their acute forms: that the theory of excessive secretion will not explain the exophthalmos; that the theory fails to explain one-sided exeophthalmos, or the association sf one-sided exophthalmos wifh one-sided thyroid enlargement: that one finds mention of cases in which the two diseases appear to co-exist: finally, that the results of thyroid feeding have been so variable as to lend no particular value to any claim at present. To his mind the primary lesion is a derangement of the whole body metabolism.

Robert Hutchison is of like mind in considering Graves' disease as consisting essentially in a specific change in tissue metabolism, due probably to a functional alteration in the central nervous system, the relationship of the enlargement of the thyroid to these changes being as yet undetermined, and for that reason not to be regarded as their primary cause. The beneficial effects of surgical operation in exophthalmic goitre were not necessarily opposed to this view.—*Journal Nervous and Mental Disease, January, 1897.*

The Symptomatology of Exophthalmic Goitre.

In an article on this subject by Dr. Wm. C. Krauss, of Buffalo, the author summarizes the primary or cardinal, and the concomitant symptoms, as follows:

Primary—
- Tachycardia.
- Goitre.
- Exophthalmos.
- Tremor.

The concomitant symptoms are classed as those of the digestive tract, of the respiratory tract, of the eye, of the nervous system, cutaneous system, urinary tract, genital organs, and those of diverse origin.

The four cardinal symptoms are pathognomic, but of these the author considers tachycardia the most important; indeed, it may precede the other symptoms by months or years, while the exophthalmos is frequently last in appearing.

As to the pathology, Krauss accepts the theory advanced by Köbens and defended by Trousseau, Fulenberg and Oppenheim, that it is due to some affection of the sympathetic nervous system. The most important element of treatment is the systematic use of the galvanic current ½ to 1½ milliamperes from one to three minutes every other day. The cathode is applied at the angle of the lower jaw, first on one side then on the other, while the anode is applied at the nape of the neck. The medical agents comprise strophanthus in gradually increasing doses, cod liver oil, trional for insomnia, bromides for quieting temporarily the nerve activity, and nux vomica and phosphoric acid for dyspeptic phenomena. He has had no experience with thyroid feedings in this disease.—*Alienist and Neurologist, January, 1897.*

Division of the Cervical Sympathetic in Graves' Disease.

Jaboulay (*Alienist and Neurologist*, Jan., 1897,) reports division of the cervical sympathetic in two cases of exophthalmic goitre, with resulting diminution of the prominence of the eyeballs in each case. Both nerves must be divided. The result is not always symmetric, as one of the nerves may be larger than the other, and thus capable of more pronounced activity. The operation is believed to be justifiable in accordance with the intensity of the symptom.

[To this last observation we would add that the operation would seem to be justifiable only in the presence of a most alarming exophthalmos, the more so as it is aimed not at the root of the trouble, but at one of its least threatening signs. Cosmetically, even, there would scarce be excuse for so radical a procedure. W. R.]

Hemianopsia Associated with Uremia.

Pick (*Centralblatt f. Praktische Heilkunde. Augenheilkunde*, Sept., 1896,) construes the preservation of the pupillary reflex as an argument against the idea of peripheral origin of uremic amaurosis. On the other hand, he says there must be shown instances of homonymous hemianopsia to lend probability to the idea of its central origin. Two cases have thus far been reported, to which Pick adds another. The patient, a chronic nephritic, exhibited perfect pupillary reaction and a normal fundus in the presence of amaurosis. In 24 hours there was found left homonymous hemianopsia. Two days later death ensued, when the necropsy showed an area of degeneration limited to the outer aspect of the second right occipital convolution. Occlusion of a small artery in the meninges covering the occipital convolution was found under the microscope, from which fact Pick infers that uremic, as well as other poisons, may probably induce endarteritis, with narrowing of a vessel and subsequent softening of the area nourished by that vessel.

The Eye Symptoms of Syringomyelia.

HINSDALE (*Syringomyelia, International Medical Magazine Co.*, 1897, a monograph of 70 pages, being the Alvarenga Prize Essay for 1896) in his study of this malady, recently so much noticed, classifies the ocular symptoms as follows: Pupillary symptoms, disorders of the eye muscles, significance of the fields, and ophthalmoscopic appearances.

Pupillary inequality is not an uncommon symptom. In the 118 cases reported it is noted 27 times. In 18 cases the right pupil was the larger, in 6 the left. Bruhl found this sign 10 times in 36 cases, and Schlesinger 24 times in 200 cases in all the accessible literature. By adding the cases of inequality of the pupils due to paralysis of the sympathetic the proportion rises to 25 per cent. Paralysis of the sympathetic is usually unilateral, though bilateral paralysis has been recorded by Schlesinger, who remarks that it is one of the initial symptoms of syringomyelia, particularly of the cervical type, and that form also which is accompanied by marked muscular atrophy. The pupils in almost every case observed reacted to both light and accommodation. In one case convergence reaction was absent.

Nystagmus is not infrequent. We find it noted in 15 out of 118 cases; usually horizontal, although it may be vertical or diagonal. It is one of the earlier symptoms pointing to disturbance of the acutely balanced co-ordination of the ocular muscles. In this respect it is closely allied to the nystagmus of Friedreich's ataxia.

Contracted visual fields were noted in 2 out of 73 cases in males, and 5 out of 38 females. French authors look upon this sign as allied with the other hysterical complications, but there is reason for doubting the assertion. Eskridge's two closely studied cases both showed narrowed fields in the absence of any hysterical taint whatsoever. When narrowing does occur, it is found chiefly in the color fields, particularly green. Scotoma has not been observed. The ophthalmoscopic appearances have not received the attention they merit. Eskridge's second case showed in the right eye a grayish white disc, with sharp edges, scleral ring particularly sharp to the temporal side, and 2 small pigment spots visible in the upper nasal quadrant about one disc diameter from the nerve head. O. S. fundus similar to that of O. D., both exhibiting incipient gray atrophy.

The Question of Retinal Tire.

MUELLER, FREDMANN, DR., (*Archiv. f. Psychiatrie und Nervenkrankheiten*, Vol. 29, Part. 1, December,) has been studying the form and color fields in the eyes of healthy persons with the view of ascertaining whether there be facts to substantiate the assertion that even in perfectly healthy eyes of healthy persons contracted fields may be demonstrated. The study embraced 102 individuals, and was fruitful of interesting results. Mueller emphasizes the fact that even with a subject of reasonable intelligence, one is almost sure, on the first trial, to obtain a contracted field that on the second trial will reach, or overreach, the normal limits; in other words that patients need to be educated in their perceptions before a really truthful field can be projected and drawn. He summarizes thus:

The examination for retinal tire necessitates a certain degree of attention on the part of the patient. As this condition of things cannot always be attained at the first sitting, examinations must be repeated in all cases where the least doubt exists. Essential retinal tire can be said to exist only when after repeated trials contracted fields persist.

All objects or incidents that might distract the attention (interefere with concentration) must be eliminated, and the object to be viewed must be made as bright as possible.

Retinal tire under examination (Utersuchungsermudung) is found rarely in sound persons. When present, it should be the starting point of a searching interrogation of all the functions of the nervous system.

Hemianopsia Associated with Otitic Cerebral Abscess.

(*Gaz. med. de. Paris*, 1896, No. 37.—In *Neurologisches*

Centralblatt, Feb. 1st. 1897.) Among the symptoms noted in connection with the case the most interesting were Alexia, Agraphia, Optic Aphasia, Right Facial Paresis, and Hemianopsia. No pus was found at the first puncture operation. Three weeks later pus was withdrawn, and a week later death occurred. The necropsy revealed a large abscess in the center of the left occipital lobe, with a diffuse encephalitis at the base of the frontal convolutions and at the lower portion of the parietal convolutions of the left hemisphere. There was also a small focus of pus in the left third frontal convolution, which was intact at the time of the first operation. This case. the author states, is the ninth one in which hemianopsia has been found associated with an otitic cerebral abscess.

On Unilateral Reflex Iridoplegia.

SCHANZ (*Archiv. f. Augenheilkunde*) comments on 3 cases of one sided loss of pupillary reaction to light. 2 of which were easily explainable by Haddeaus' idea of the two fold origin of the iris branch of the third nerve. The third case presented great difficulty of diagnosis. The patient, aet 37, was the subject of ocular palsies when 33 years of age, but was entirely relieved by treatment. At the time of writing. there was diplopia, and suspicion of Tabo-paralysis. Paralysis of the right superior rectus, immobile pupil, and paretic accommodation persisted in right eye in spite of vigorous treatment. The lids were retracted. the bulbs prominent. There was left miosis and irido-plegia (accommodation normal, although there had been spasm previously). In other words, there was right nuclear palsy of the superior rectus, also of the sphincter iridis and the ciliary muscle—while the left sphincter nucleus and previously the left accommodation nucleus, as also the levatores palpebræ of both eyes, were in a state of irritation.

The left pupil, which was miotic and immobile, dilated when the patient gazed at a distant object—a fact which the author interprets as the external manifestation of coincident excitation of the sphincter and ciliary nucleus. With the relaxing of the accommodation there was lessened stimulation of the pupillary nucleus with consequent dilatation of the pupil although it was at no time as wide as the other pupil.

In none of the cases could the hemianopsic pupillary reaction be shown. All were of syphilitic origin.

Two Cases of Wernicke's Disease.

These two instances of polioencephalitis superior acuta, reported in the *Neurologisches Centralblatt*, February 1st, 1897, exhibited quite an array of eye symptoms.

The first case was observed in a woman who had contracted catarrhal pneumonia three months prior to the appearance of the brain disease. About the time of her recovery from the lung trouble, she developed excruciating headache, seizures of cortical epilepsy, paresis of the left side of the body, failing vision passing rapidly into blindness, optic neuritis without choked disc, right sided ptosis, almost complete immobility of the right globe. There was paralysis of the right, and paresis of the left iris. Of the general symptoms, the most pronounced were pains in the back and abdomen. The knee jerks were entirely gone. At the time of her removal to the hospital dyshcromatopsia was noticed. Objects of every description took on a blue or yellow aspect. Death ensued shortly after her admission to the hospital, when the autopsy showed a sarcoma in the median portion of the anterior parietal convolution. There was also found an hemorrhagic process in the region of the pons, the large ganglia, and the cerebral peduncles, with involvement of the central canal.

The second case occurred in a clerk, aged 46, who was an alcoholic, and admitted infection when 20 years of age. One year ago vision began to fail and diplopia developed. When examined a month later, there was absolute inability to perform the associated lateral movements, although none of the individual muscles of either eye were palsied. The vertical associated movements were all right. All movements of either eye were nystagmic. Slight double ptosis. Pupil R. E. 2 m.m., L. E. 2½ m.m. Reaction to light and accommodation normal. Eye grounds normal. There was paresis of the lower half of the body and absence of the knee jerks. Under specific treatment the condition of the eyes was much improved. Later, with excitant treatment (electrization and strychnia), the patient recovered, showing only one remaining eye symptom—namely, anisocoria.

On the Association of Acute Myelitis and Optic Neuritis.

Dr. Katz (*Archiv. f. Ophthal.* Bund, XLII), reviews the details of a case of coincident acute myelitis and optic neuritis that occurred under his observation. To this history he adds those of twenty other reported cases, and then speculates at some length on the correlation between the two processes. He rejects the theory of a vasomotor relation of the cord and eye symptoms; also the theory of optic neuritis, secondary to ascending meningitis. He is inclined to look upon the two conditions as expressions of the same process taking place coincidentally in different portions of the nervous system. The identity of the pathologic findings in the cord and the optic nerve leave little doubt that there is the same disturbing influence back of both lesions. Just what the nature of that influence may be, he hesitates even to attempt to explain. Much investigation along this line is needed.

NOTES AND ANNOUNCEMENTS.

(Under this heading the ANNALS will publish items of interest to its readers. Please address Albert B. Hale, M. D., Columbus Memorial Building, 103 State street, Chicago.)

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Prof. Hirschberg, of Berlin, has been decorated with the Order of the Red Eagle, fourth class.

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Dr. Francis B. Kellogg has left Tacoma, Wash., and taken up his residence in Los Angeles, Cal., at 420 W. Sixth street.

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Dr. Albert B. Hale has moved his office from the Venetian Building to the Columbus Memorial Building, Chicago.

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Dr. Albert E. Bulson, Jr., of Fort Wayne, Ind., is now in charge of the consolidated *Journal-Magazine* of Fort Wayne, and his first numbers have a decidely attractive appearance.

◆

In the "Academy of Specialists," just opened as a teaching school in Madrid, Spain, the following professors have been appointed: Ophthalmology, Dr. Enrique Perez Zuñiga; Oto-Rhino-Laryngology, Dr. Rafael Forns.

◆

Dr. Henry Gradle has been appointed to the professorship of Ophthalmology and Otology in the Medical Department of the Northwestern University (Chicago Medical College), vice S. J. Jones, resigned. Dr. Gradle expects to attend the Moscow meeting of the International Association this summer.

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The banquet for the Ophthalmological Section of the American Medical Association is scheduled for 7 o'clock Tuesday evening, June 1, 1897, at the Hotel Walton. Any one wishing to attend this dinner should at once declare his intention to Dr. G. E. de Schweinitz, 1401 Locust street, Philadelphia. The price of the ticket is $3.

◆

The Eye and Its Diseases, according to the Bible and the Talmud. A Historical Study by Dr. J. Preuss, Berlin, is the title of a series of articles recently completed in the *Wiener Medicinesche Presse.* It gives many curious instances of the then prevalent eye troubles, showing a mixture of wisdom and superstition, which has not altogether disappeared, even in our day.

◆

Alfred Nobel, inventor of dynamite, recently deceased, has left 22 millions of gulden as a fund for the support of art and science. The interest from this endowment is to be divided so as to give yearly prizes for the best work done in the field of chemistry or physicis; to the best discovery in either physiology or medicine; to the most remarkable imaginative production in literature; and to the one who has done most to further the cause of peace. The receivers of these prizes may be of any nation.

◆

The Chicago Eye, Ear Nose and Throat College for post-graduate instruction has commenced work in the Trude Building. The following constitute the faculty: W. A. Fisher, M. D., John R. Hoffman, M. D., Allen T. Haight, M. D., John F. Oaks, M. D., Edwin Pynchon, M. D., Charles L. Enslee, M. D., Thomas Faith, M. D., E. M. Webster, M. D. Columbus Medical Laboratory Pathologist.

◆

The fiftieth anniversary of the founding of the American Medical Association will be celebrated at its next annual meeting, which takes place in Philadelphia, June 1-4, 1897. As Philadelphia has done so much to advance the science of ophthalmology, and as the cordiality and hospitality of its medical men are so celebrated, it is to be hoped that all the sections, and that of ophthalmology in particular, will be well attended, and that the work done there may be the envy of the civilized world.

◆

An injustice seems to have been done to Prof. Fukala in a recent criticism in one of the German medical periodicals. His theory of the relief for high degree of myopia was attacked and his late book on the subject condemned, while the complaint was made that Fukala had done nothing else to attract attention to his name. Any one who knows of Prof. Fukala recognizes the error in the criticism, for he has been an industrious writer for our literature, he has made two visits to this country, largely in the interest of ophthalmological study, and his book is intended as a practical guide to the practitioner, not as a theoretical exposition for the student.

◆

Peter Dirck Keyser, A. M., M. D., formerly professor of Ophthalmology at the Medico-Chirurgical College of Philadelphia, died on the 9th of March, 1897, of pneumonia. He was born in Philadelphia of German parentage, and studied chemistry early in life; after serving for two years during the War of the Rebellion, he went to Germany and was graduated M. D. from the University of Jena. In 1864 he lectured to physicians on refraction and accommodation, and two years later he began a regular series of lectures on clinical ophthalmology. He was surgeon to the Wills' Eye Hospital for over twenty years. He was active in all professional matters, and a vice-president of the Ophthalmological Section of the Ninth International Congress in 1887 and of the Tenth in 1890. He devised an ophthalmoscope which bears his name.

◆

In connection with the twelfth International Medical Congress, to be held August 19-26, 1897, at Moscow, an excursion has been organized under the direction of Thomas Cook & Son, with the intention of visiting a number of places of interest *en route*. The whole party sail July 3d, per North German Lloyd steamer "Werra," and proceed via Naples to Rome. There the party divides, one section traveling by way of Northern Italy, Switzerland, Munich and Leviz to Vienna. The other section sails from Brindisi to Athens and Constantinople, meeting the first section (via Buda-Pest) at Vienna. Thence the excursionists will reach Moscow by way of Warsaw.. On the home journey St. Petersburg, Stockholm, Christiania, Copenhagen are visited, and at Hamburg the party again divides into two sections—one sailing for New York and the other returning to Havre by way of Berlin, Dresden, the Rhine and Paris. The promoters are the following Chicagoans: Nicholas Seen, D. R. Brower, Casey A. Wood, J. B. Murphy, Harold Moyer, D. A. K. Steele, E. S. Talbot and B. T. Whitmore. Further particulars may be had by applying to the Messrs. Cook & Son.

◆

Dr. E. Buck suggests in *Memorileilien* for February that if letters are painted on a sheet of card board, afterward varnished and dusted with powdered metal, or the letters are made as gold leaf is applied, the Roentgen ray will throw their shadow through the opaque cornea of the blind, and if the optic nerve is still sound the blind person will see the shadowgraph thrown on the retina. He urges experts to experiment in this line with persons who have lost their sight from opacity of the cornea, etc., and quotes Professor ——— of Vienna as authority for its feasibility. *Journal Amer. Med. Assn.*, March 27, '97.

[This illustrates an error that is continually appearing in general as well as in ophthalmological literature. The X-ray has no influence on the optic nerve as such—we do not perceive the ray itself, nor its transmission through an opaque substance, but merely observe its results on a properly prepared sensitive plate or on the fluorescent screen. The future may develop a new ray, or a new method, but at present all efforts to permeate the opaque cornea seem futile. A. B. H.]

◆

Dr. Moritz Schneller, of Dantzig, died on the 9th of October, 1896. He was born near Tilsit in 1834, and studied in Koenigsberg, where he was a pupil of Helmholtz. Afterwards, in Berlin, he studied with Graefe, and with Arlt and Rokitansky in Vienna. With Nagel (afterward Prof. in Tübingen) he founded an eye clinic in Danzig, which he kept alive all his life, even operating for cataract on the day of his death. His fame was wide spread, and his zeal indefatigable, for only a short time ago he reviewed his elementary mathematics, so as to prepare himself better for advanced study of optics and refraction. Schneller was one of the first investigators with the ophthalmoscope, which he helped to devise, and wrote much about fundus changes in general systemic diseases. The mysteries connected with muscular anomalies have also been largely cleared up by his efforts, and his latest experiments and conclusions he had hoped to publish this winter in a book that was nearly completed. He also made elaborate investigations among school children concerning the development of myopia. He studied the use of prisms, and his test letters are particularly commendable for their exactness.

Sneller conducted a general practice all his life, and often claimed that this was necessary for the ophthalmologist to balance his special work. His enthusiasms were always scientific, never practical, and, in spite of a large practice pursued for many years, he died a poor man, beloved by his neighbors and colleagues. A wife and three children survive him.

As will be seen by the Announcements on the cover of this number it has been decided to issue the ANNALS OF OPHTHALMOLOGY AND OTOLOGY in two portions, the ANNALS OF OPHTHALMOLOGY as usual in January,April, July and October, and the ANNALS OF OTOLOGY (including Rhinology and Laryngology), during the succeding months of February, May, August and November. It is believed that such an arrangement is to the best interests of all concerned, and we assure our readers that no trouble or expense will be spared to retain the enviable position that the combined periodical has in the past attained. Notwithstanding the vast amount of literature made accessible to the profession by the pages of the ANNALS during the past year (more than double that of any similar journal or journals) the low subscription will be maintained during 1897. It is hoped that every subscriber to the ANNALS will show his appreciation of the "labor of love" that has been expended upon this American enterprise, and will give it his help in every sense of the word.

Professor Dr. D. Doijer, of the University of Leyden, died at his home there on the 21st of December, 1896. Doijer was for 27 years professor of ophthalmology at this school in Holland, and is one of the last links between the older students of the science and its later devotees. He was the first to be appointed to this special chair in the Government University, and as such he occupies an important historical position. Although Donders had for 10 years conducted a clinic for eye diseases in Utrecht, that clinic was independent of the government—as it is yet, for that matter—so that official instruction in ophthalmology dates from Doijer's work at the university. He began his medical work at Utrecht, where he soon made the acquaintance of young Donders, who had already attacked the problems of refraction and its anomalies. The two were attracted to each other, and Doijer gave much help to Donders in his studies, but Doijer soon left Holland to take a position as military surgeon in the Dutch East Indies (Java). Here he lost none of his enthusiasm for ophthalmology, and in 1860 he returned to his native country to resume the study of the eye, developed as it now was by the many discoveries with the ophthalmoscope. He again worked with Donders, partly as "voluntary" assistant, till, after 2½ years' stay he returned to Batavia. Here he soon after resigned his post as military surgeon and began private practice, in which his success was immediate and lasting, first as general practitioner and then as oculist. He was not long in becoming financially indepent, but his love for his work was so great that he determined to return to his native country, which he did in 1869, being then 42 years of age. It was a great surprise when he almost immediately received the appointment as extraordinary professor of ophthalmology at the Royal University of Leyden. His zeal was unbounded, and he had great opportunity to develop his work, but his hospital facilities were very inadequate, and he had to train not only his servants but also his assistants. Doijer felt impelled to add the ear to the eye in his teaching, for this branch had no instructor at all in his university, and his great friendship with Dr. Hans Wilhelm Meyer of Copenhagen (known for his work on adenoid vegetations in the nasopharynx) made him appreciate the value of the added study.

His industry was enormous, while his character as a man made its impress on all who knew or met him, so that Holland, as well as ophthalmology in general, has lost one of its leaders.

BOOK NOTICES.

The Year-Book of Treatment for 1897.

A Critical Review for Practitioners of Medicine and Surgery. Crown octavo, 488 pages. Cloth, $1.50. Philadelphia and New York. Lea Brothers & Co., 1897.

The 13th issue of this well-known book has just come to hand, and although it is not as complete and as thorough in the matter of therapeutics as its congener, the American Year-Book of Medicine and Surgery, is still deserving of considerable praise. Twenty of its (small) pages are devoted to diseases of the eye, and although that seems a small space in which to record the advances in the healing art made by ophthalmologists throughout the world during the past year, it cannot be said that the selections, thus confined, have been injudicious or that they could be well improved upon. Mr. Power has not been partial in his difficult task of choosing favored therapeutic measures from the many that the past year has brought forth, as witness the fact that a selection has been made of remedies of American, French, German and Italian origin —quite as much as from those of British sources.

Without attempting to "review the reviews" made in this excellent little work the reader will be pleased to find the chief propositions in ophthalmology that are still *sub judice* referred to and the evidence *pro et con.* summed up in a few trim sentences. This is done, for example (p. 383), in discussing the question of performing iridectomy in chronic glaucoma, the operative treatment of myopia (p. 380), the treatment of granular lids (p. 376), the treatment of strabismus (p. 389), etc.

Altogether the plan of the Year-Book of Treatment is a commendable one and its consideration of ocular therapeutics, so far as it goes, leaves little to be desired. C. A. W.

The Ocular Muscles and Ocular Palsies.

By DR. OSKAR ZOTH. F. Deuticke, Leipsig u. Wien, 1897.

In this brochure of 31 pages the author has succinctly stated the known facts concerning the normal and abnormal states of the extra ocular muscles. He touches briefly on the physiology of ocular movements, individual and associated, and then outlines his own methods for detecting and locating the position of the false image in diplopia. While the scheme is a simple one, it is in nowise better than many employed today, and it will hardly supplant the means now in vogue with most practicing ophthalmologues. The booklet is well adapted to the uses and purposes of the beginner in ophthalmology for whom, the author states, it was designed. W. R.

On Neuro-Epithelioma Retinæ.

A clinico-anatomical study. Dr. Hugo Wintersteiner. F. Deuticke, Leipsig u. Wien, 1897, 150 pp.

Notwithstanding the thorough treatment accorded ocular tumors in the last five or six years, much remains to be said about glioma or, as our author has it, "neuro-epithelioma", retinæ. Until the questions of origin and curability have been definitely settled there will doubtless come regularly to hand many just such contributions as the one before us. It will be only through such labors that our knowledge of ocular glioma can be completed. However, this particular study adds little to the present status of the question. The fact that the affection is met with chiefly in children is too well known to need restatement in anything but a text book. Nor does the author's picture of the development of glioma add any point that renders easier the diagnosis. Of all cases so far reported, he found the condition binocular in 24 per cent., and its average duration to be $1^1/_2$ years. As to origin, the author states plainly that "the seed of the trouble is sown in utero no matter how late in life it may make its appearence." He further believes that the condition is curable in its earliest stages. To this latter statement most surgeons will assent, but doubtless each one would also comment at some length on the extreme difficulty of exact differential diagnosis in the first stage of ocular glioma. W. R.

A Brief Sketch of the Anatomic and Clinic Study of Retinal Epithelioma.

WINTERSTEINER, HUGO, Vienna, *(Das Neuro Epitheloma Retinæ)* Verlag von F. Deuticke, Leipzig u. Wien, 1897.

The term neuro-epithelioma is preferred to glioma or neuro-glioma. The proliferated epithelium cells are characteristic of these growths rather than the intercellular substance or neuroglia. He includes the work done by Hirschberg upon medullary sarcoma of the retina, dating back a quarter century and gives so acurate a clinic picture that later researches may make but slight modifications. Methods of anatomic investigation have greatly improved. An excellent description of the anatomic changes produced in the eye by primary tumors of the retina is given by W. Histologic examination of 32 cases shows the following characteristics of primary retinal tumors: Their structure is to a certain degree dendritic, tubular and lobate, with a peculiar rosette-like appearance. There is a perivascular accumulation of pigmented cells. Degeneration of the intercellular substance appears very early.

Often there is conversion of deeply pigmented cells into a semi-necrotic, poorly pigmented mass. Where there is a sharp boundary between the proliferated cells and degenerated intercellular tissue, growth of the former into the latter may sometimes be seen. Most of these neoplasms are composed of small, polymorphous cells. Much importance is placed upon the occurrence of cauliflower forms.

Much space is devoted to consideration of the retrograde metamorphoses which these growths undergo. These appear very early, progress rapidly and are probably due to a lack of a nutrient capillary system in the tumor. Single, atypical instances are exceptionally seen. Notwithstanding the lack of capillaries there are numerous blood vessels in these tumors and with the imperfect methods of histologic research formerly in vogue they gave the impression of being vascular growths. The vessels are prone to undergo degeneration, hence the great frequency with which intraocular neoplastic hemorrhages occur.

The tumors usually arise in the posterior part of the eye, generally from one of the deeper retinal layers, but without a recognized predilection for any special one. The growth may take place in the sub-retinal space; may extend along the retina, destroying the same, the diffuse form; or, it may grow into the vitreous. W. discusses the extension of the growth to neighboring structures and makes the interesting statement that in all advanced cases a delicate membrane is to be found extending out from the region of the ora serrata, cutting off the view of the retina. Upon ophthalmoscopic examination this can easily be mistaken for a section of detached retina, or for the superficial surface of the neoplasm. It consists of connective tissue, leucocytes and melanotic, gliomatous or sarcomatous cells according to the character of the tumor. A characteristic is a scarcity of vessels. The ciliary body sooner or later undergoes atrophy and is often involved in the riotous overgrowth of cells.

The optic nerve usually participates in the neoplastic cellular proliferation, undergoing simple atrophic changes, and at the same time altered intra-ocular tension develops.

The clinic study embraces observations of about 500 cases. Glioma is a rare ocular disease (0.04 per cent. of all eye cases). It occurs exclusively in the early years of life and W. thinks it always congenital. Opinions differ as to the etiologic significance of sex. W. found it more frequently in boys than in girls, and in the left eye than in the right. Often both eyes are implicated. The average duration is $1^1/_2$ years and its course is divisable into three stages. The difficulty of differential diagnosis from medullary sarcoma is discussed. Opacity of the media may render impossible the recognition of a glioma in the second stage of infantile glaucoma. Sometimes simple detachment of the retina, leucosarcoma or tubercular endarteritis may complicate diagnosis. More often the changes consecutive upon chronic uveitis are troublesome. Color, appearance of the tumor and ocular tension are then often insufficient means of differentiation. Untreated, the course of these affections tends inevitably to death. The only remedy is instant operation. W. has had a percentage of recoveries of 13 per cent. to 16 per cent. His cases having been watched for one or two years, and showing no recurrence in that time in the proportion given. The prognosis is uncertain. Operation for recurrence is vain.

In order to determine the necessity of exenteration in preference to enucleation the tumor of the eyeball is to be observed. When this is elevated, exenteration is to be considered necessary to prevent recurrence. Very deplorable are these cases where both eyes are diseased, still it is the duty of the surgeon, according to W., to seek to preserve life, albeit it be to rear a sightless child. H. V. W.

The Visual Acuity of Squinting Eyes.

GRAEFE, ALFRED. *(Das Sehen der Schielenden.)* Verlag von J. F. Bergmann, Wiesbaden, 1897.

I. The first chapter treats of the physiologic processes by which visible objects are located. The visual axis for each eye is determined by the optical conditions present. Under normal conditions every point on the retina projects the images it may receive in the same direction to its particular portion of the normal field. It is not to be concluded from this that the visual field is located according to these centrifugal lines of projection exclusively, for it really depends much more upon the motor apparatus of the eye. In disturbed innervation of the ocular muscles the line of vision may fail to coincide with the line of projection and direction of localization of the object viewed.

II. What disturbances of binocular vision are to be expected in strabismus? The eye may be thrown into an abnormal position by an anomalous shortening of a muscle quite independently of disturbed innervation. The same disturbances in localizing objects occur as in this form of strabismus and in paresis as occur when the eye is forcibly deflected from its normal position with a forceps. There is diplopia. The fact that this is often seen without being demonstrable is because strabismus usually begins early in life when functional tests are impossible.

III. What changes in binocular vision actually occur in strabismus? The visual fields are not superimposed but are separated, similiar images are not formed in either eye and it is generally supposed that the perception of one is suppressed in order to avoid confusion. This is not the case. Two theories have been proposed to explain this difficulty: (a) The image perceived by the squinting eye is totally neglected and unaided monocular vision practiced. (b) The part of the visual field of the squinting eye which overlaps that of the eye which possesses direct vision is recognized, assists vision, and to that degree binocular vision is practiced. The latter view is held by G.

The image formed at the macula of the everted eye is of a part of the periphery of the field of the other eye and reinforces it. In order that this may occur the everted eye must be in its usual position, as is proved by placing a prism in front of it when diplopia occurs (regional exclusion). Whether objects in that portion of the field be observed or not depends upon the psychic process called attention.

G. thinks the visual acuity of the poorer eye to be without significance in the process of exclusion or suppression of its sensibility which develops gradually, beginning in one portion of retina and spreading slowly to the adjacent parts, and sometimes finally including the entire retina (absolute exclusion).

Single binocular vision does not depend upon exclusion alone, but also upon a condition of changed identity of the retina. This is a result, not a cause of strabismns. It develops slowly and is probably an education of the receptive nervous elements in the retina, or of their corresponding cortical cells. There frequently is opportunity to observe the conflict between the old and new conditions of identity in the retina in those cases in which tenotomy, for example, is done after single vision has been secured by the patient.

Double vision occurs after operation without the patient being able to say whether the double images are homonymous. With the correction of the faulty position of the eyeball the condition most suitable for recovering binocular vision is restored, provided the changed indentity of the retina has not occurred. Otherwise it may be very difficult for the patient again to attain single vision, the diplopia being very obstinate. Generally, however, the retina returns completely to the normal.

IV. In strabismus the head is held sideways as a matter of convenience.

V. The amblyopia in these cases is pre-existent. Here it differs from those cases in which there is no strabismus, in that the latter presented but slight difference in the degree of amblyopia in either eye. The ostensible great improvement of the vision after operation is largely apparent in many cases from imperfect earlier tests. The test letters are usually held directly in front of the patient's face and, to be seen, requires the eye to be rotated to center of the palpebral orifice. This is uncomfortable for the patient, he permits the eye to remain in the accustomed position and the correct amount of visual power actually present is not estimated. H. V. W.

The American Year Book

Of Medicine and Surgery, 1897, pp. 1257. Under the general editorial charge of Geo. M. Gould, M. D. W. B. Saunders: Philadelphia. Ophthalmology (pp. 890-956), by Drs. Howard F. Hansell and Wendell Reber.

The ophthalmic portion of this excellent retrospect compares very favorably not only with the corresponding part of the work issued in 1896, but with the chapters devoted to other branches of medicine and surgery. To the ophthalmologist who reads the principal American and foreign ophthalmic journals these pages will act as a refresher. but whether he does or not he can review in them the various additions, useful and useless, that have been made to the body ophthalmologic during the past year, and decide whether or not he is in agreement with the editorial criticisms that accompany them.

The general epitome that heads each chapter, and that serves as a sort of commentary upon the progress of the particular specialty under consideration during the past year, is recommended to the attention of the ophthalmologist. It is not given to all of us to be omniscient but we can, from these introductory generalizations of the Year Book alone. in a couple of hours' reading, gather in and store up at least some idea of what has been going on in "other worlds than ours" in the preceding twelve months. In this way we may be able to avoid that narrowness against which we are so often warned but which, alas! is so difficult to avoid after forty years are passed.

The general physician is himself not without blame in this matter, and we would point out to him at least the admirable introduction to the ophthalmic part—which he usually skips. The amount of work that has been put into the Year Book as a whole is evidently enormous, while the faithfulness with which that part of it assigned to the visual apparatus has been executed makes us hope that no ophthalmologist will hesitate to invest in a copy simply because it is not all written in the particular interest of his own specialty.

It is presumed by many that the chief duty of the reviewer is to discover errors of some kind or other in the book submitted to his criticism, but we have so far failed to encounter any in this instance, unless spelling Angelucci's name (p. 923) with two "ls" and referring to his journal as the "Rec. di ottal." be regarded as deadly sins. On the contrary, in arrangement of matter, in choice of headlines, in editoral comments, in winnowing the 1896 wheat from the accompanying ophthalmologic chaff the editors are deserving of all praise and no blame. We do not very well see how the ophthalmic part of the Year Book could be greatly improved. C. A. W.

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	Glycerini,	f.	ʒiii
	Sodii bicarb., Sodii biborat ,	aa.	ʒjss
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Sig. f ʒ i in ʒ ii warm water snuffed up the nose, and as a gargle for the throat three times daily.

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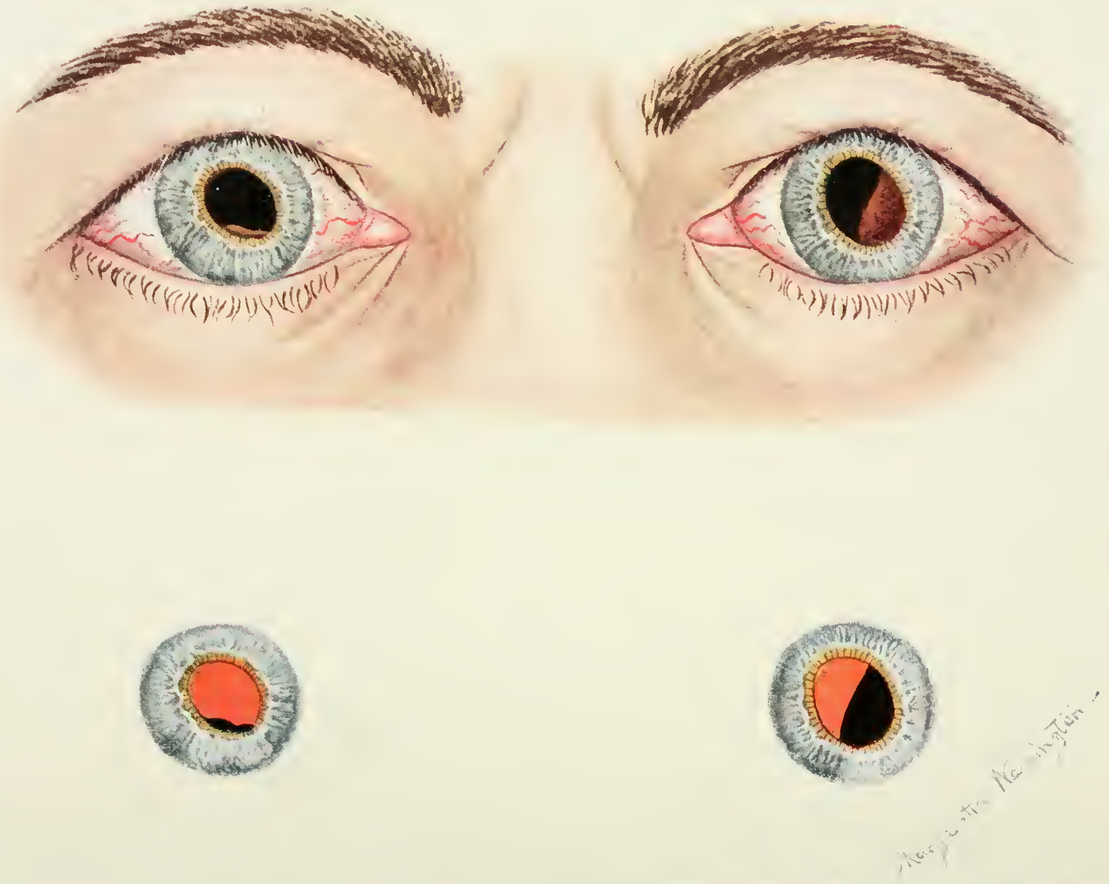

Margaretta Washington.

ANNALS
OF
OPHTHALMOLOGY.

Vol. VI. JULY, 1897. No. 3.

A CASE OF BILATERAL MELANOTIC TUMORS, PROBABLY CYSTS OF THE CILIARY BODIES.

By M. W. Zimmerman, M. D.

OPHTHALMIC SURGEON TO THE GERMANTOWN HOSPITAL, PHILADELPHIA.

With Colored Frontispiece and one Cut in Text.

On April 17th, 1893, Mrs. J., aged 59, the wife of a mechanic, was sent to me by the family physician, Dr. Alrich, of Germantown. Reading had become very difficult, and vision for all purposes somewhat impaired. The patient was very positive, however, that she had not been conscious of visual failure for more than two weeks. There was also much frontal pain, varying in severity, and with occasional intermissions of one or two days. This pain had probably been in existence for many months, but was distinctly increasing in severity.

Excepting the death of an aunt soon after operation for an abdominal tumor, the family history was entirely negative. No history of intra-ocular tumor, or other serious disease of the eyes, could be obtained. The patient reported no illness of moment since childhood, except following a miscarriage 25 years before. Three healthy children were born subsequently. The patient's face showed distinct pallor, and there had been some recent loss of flesh. Her family claimed to have noticed a change in appearance,

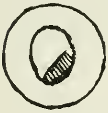
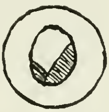
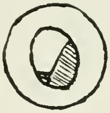
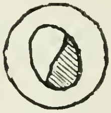
The conjunctiva of the left eye was slightly injected, that of its fellow entirely normal. The pupils were of proper size and shape, and responded promptly to light, but the movements were distinctly limited. Tension was normal in both eyes. Form and color-fields were not taken, but these were probably unimportant, except where peripheral vision was obstructed by the tumors. The lower and outer quadrant of each iris was bulged forward, the deformity being very marked in the left eye. No injury to the iris tissue could be discovered. Homatropine gave moderate dilatation, the pupils being oval with the long diameter vertical. The media were clear, and the eye-grounds entirely without gross lesion. Extending into each pupil there was a mass of dull brown color, which filled the space between the anterior surface of the lens and the posterior surface of the iris, and corresponded in position and extent, to the bulging of the latter structure previously described. The mass in the left eye was much larger, and extended to the edge of the undilated pupil, the lens being tilted backward at the site of the growth. Nothing of a similar nature could be seen behind the lens of either eye, although a very careful search was made. Weak solution of eserin was prescribed, but it caused much pain and was discontinued.

On April 21st, four days later, homatropine dilatation was again secured, and the eyes re-examined by Dr. Edward Jackson and myself. There had been no change in the conditions, except possibly an increase in the left tumor, A small nodule below, with its margin at a right angle with that of the larger mass was now seen for the first time. The diagnosis of melanotic sarcoma, with a suitable prognosis, which had been previously given, was concurred in by Dr. Jackson, and immediate iridectomy on one eye advised in the hope that the point of origin might be in the iris and removable by free excision of that organ. The right eye contained the smaller growth, was selected for this purpose as offering the better prospect of success.

Owing to the gravity of the prognosis, another consultant was asked for, and Dr. George C. Harlan saw the patient four days later. Examined under the influence of atropia, the growth seemed to have increased, but this may have been due to the greater enlargement of the pupils. The edge of the iris in dilating was drawn over the comparatively smooth surface of the tumors in such a manner as to convince us that the point of origin was beyond the iris, and probably in the anterior part of the ciliary body. The exposed portion also indicated a very broad base. The smoothness and absence of nodulation was very pronounced, and led Dr. Harlan to suggest that the *visible* portions might be cystic. There was, however, at this time no doubt about the malignant character of the tumors, and the prognosis remained unchanged. Iridectomy was considered inadvisable, as there seemed to be little chance of including all the growths, and the idea of operating was abandoned.

Since the above notes were made I have seen the patient frequently, and kept the eyes under very careful observation. Much to my surprise, the tumors have increased very little in size, but there have been several changes in outlines of the visible parts. I have tried to indicate the changes occurring in the left eye by the following diagrams, which are based upon rude drawings made from time to time:

The total result of these four years has been a distinct but not great increase in the left eye, and very little, if any, in the right. Vision has remained throughout at about one-third of normal, sometimes more, and at others slightly less. Near work is only possible for a very short time with comfort, but otherwise the eyes have been quiet and painless. Serious headache ceased long ago. Intraocular tension has probably never been raised, but efforts to determine this have been abandoned because of the pain which always followed palpation. The patient's general health is very good, and her appearance distinctly better than when she first came under my observation four years ago. At no time since the early trial of eserine has treatment of any kind seemed indicated.

In view of the comparative infrequency of benign pigmented tumors, the only reasonable early diagnosis seemed to be melanotic sarcoma of the ciliary body, nor can this even now be excluded, as the latent stage of such growths has in a few instances been known to exceed the time this case has been under observation. The development of cysts from such new growths has not been observed frequently, and is unlikely to occur in both eyes, as would be necessary to explain the similarity of appearance here. At present we cannot be certain, but I would venture the opinion that this is a case of uveal cyst, not secondary to malignant neoplasm, and probably arising from the anterior border of the ciliary body.

The accompanying water-color drawings, made by Miss Washington, show the present appearance by oblique illumination and with the mirror. These drawings are on a scale of about one and a half diameters, and show all details except the forward crowding of the iris, and backward tilting of the left lens, which could not be reproduced. The displacement of the iris is given to some extent in the right eye.

In connection with this case a brief review of the whole subject of tumors of the iris and ciliary body may be of interest, and for this purpose all such tumors can be divided into two groups—those having at least some of the characteristics of the case under consideration, and those which may be definitely excluded. In the *second* group may be placed the following:

1. Clear serous cysts of the iris, usually of traumatic origin, and starting from epithelial tissue which has been

implanted. These are, as a rule, without pigment, and arise from the anterior surface of the iris. Richard Greeff (1), whose paper furnishes a recent and exhaustive analysis of tumors of this class, states that they may arise in the anterior layers, the substance, or beneath the posterior layer of the iris. The latter variety being alone of interest in this report, will be referred to later. These cysts are all benign, but destroy the eye by secondary iridocyclitis unless removed.

2. All solid unpigmented cystic tumors in the iris, including dermoid, myxoma, cholesteatoma, and those containing closely packed epithelium, and frequently classed as pearl tissue.

3. Unpigmented or leucosarcoma of the iris and ciliary body.

4. Vascular growths springing from the iris tissue, which are pinkish in color, and may give hemorrhage into the anterior chamber. Several cases have had their origin in the anterior iris wall, or the pupillary margin.

5. Granuloma and tuberculosis of the iris.

The *first* group, containing the tumors which, from their location and appearance, resemble more or less the case now being reported, contains the following varieties:

1. Benign cysts, with liquid contents, but having pigmented walls. These are by no means common, but several have been reported. To this group belongs the bilateral case of Williams, which will be referred to later, and probably one of Collins' cases quoted by Oemisch (2). Also a case seen by Fuchs (3) and described as a blackish brown prominence filling the pupil, and appearing larger when the latter was dilated. He considered it to be the free border of a larger tumor in the posterior chamber, which crowded the iris forward. It started in the iris tissue near the posterior pigment layer, and was composed entirely of cells analagous to the physiological pigment cells found in that tissue. A case reported by Greeff (1), occurring five years after successful cataract extraction, in which the iris was bulged forward, and the pupil, as well as the coloboma, entirely filled by dark masses. The specimen showed two cysts behind and attached to the iris, but springing from the ciliary body. These had pigmented walls, contained fluid, and were thought by him to be the result of a gradual distension of a closed space in the ciliary processes, formed by the adhesion of their

surfaces during an attack of post-operative irido-cyclitis.

Eales and Sinclair (4) have recorded the case of a man, aged 47, whose left eye was in a condition of absolute glaucoma. Extending into the pupillary area from behind the iris were two dark globular masses. These showed fine jelly-like quiverings when examined with a magnifying glass. Examination of the specimen verified the diagnosis of cystic detachment of the posterior uveal layer of the iris. They considered it the first case of this kind diagnosed clinically.. Collins (quoted by Greeff) had a case with immature cataract, behind which was a dark cyst described as formed by the posterior pigment layer of the iris. This collapsed when the iris was seized for an iridectomy, and a portion was examined. Fuchs has suggested that the diagnosis of such cysts from sarcoma could be materially aided by puncture through the sclera or cornea.

2. Pigmented sarcoma involving the ciliary body, spreading into the posterior chamber and becoming visible in the pupil. These are probably rare, as ciliary sarcomas usually grow forward through the base of the iris, producing irido-dialysis. This possibility is, however, recognized by many of the important writers. I have been unable to find reported cases in which such a course of growth is clearly described.

3. Sarcoma primary to the iris, of which the majority are melanotic, Oemisch (2) in 1893 collected thirty-five carefully reported cases, but does not separate the melanatic cases. Occasionally they are multiple. The relative frequency of such growth is, perhaps, shown by the analysis of 259 sarcomas of the uvea, made by Fuchs, in which were included 16 of the iris. In a group of 103 collected by Lawford and Collins (5), only one was classed as belonging to the iris. These are nearly always visible on the anterior surface, and I have been unable to find mention of their appearance in the pupil from behind the iris.

4. Congenital pigment spots, and the benign melanomas which are of interest because they may develop malignancy, as in a case reported by Whiting (6). These melanotic nodules, when situated at the pupillary edge, may become detached and particles float free in the anterior chamber.

The frequency of bilateral intra-ocular tumors could only be ascertained by a careful study of all published cases. Text-books and important papers are usually silent upon this point. Berry, in his last edition, says: "Sarcoma is very rarely bilateral. I can, however, refer briefly to two reported cases, all that have come to my notice."

Dr. Henry W. Williams (7) of Boston, saw a girl aged 9, who had in the right eye a large projection, slightly folded, resembling a large cyst, extending downward from the upper margin of the pupil and a similar growth from the temporal border. At the lower and inner parts of the field of the pupil were two small pedunculated growths of a similar aspect. They were dark brown, smooth, and appeared as if made up of distended healthy iris tissue. In the left eye two somewhat convoluted cysts of like aspect filled the pupillary space from above and below. Atropia produced little effect on the pupil, and did not permit a view of the fundus through the small angular openings at the centers of the pupil spaces. Unfortunately the patient was seen but once, and I know of no subsequent report.

Robert Brudenell Carter (8), of London, reported the case of a slight but healthy lad, aged 15, with a good family history. Three months before, the first speck on the iris of the left eye had been noticed, and two weeks before examination two spots on that of the right eye. A tumor the size and color of a split pea was on the lower and inner quadrant of the left iris, extending to the margin of the anterior chamber and encroaching on the pupil. It was in contact with the cornea, and covered with vessels. Other portions of the iris were in good condition. Two small tumors, the size of pins' heads, of the same character were situated on the outer margin of the right iris. The tumor in the left eye was excised and proved to be a round-celled sarcoma. The growth reappeared in this eye and the case was progressing when reported.

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REMARKS ON THE TREATMENT OF A CASE OF COMPLETE OBLITERATION OF THE NASAL CANAL, FOLLOWED BY CURE.

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One must naturally hesitate nowadays before venturing to express an opinion on the term "new," as applicable to any form of treatment, and I only do so in the present instance, after having made every available research without finding the slightest mention of the matter. It affords me the greater satisfaction in bringing forward this detail of treatment now, as I believe it will be the means of removing easily and readily one of the great obstacles hitherto met with, toward the satisfactory and permanent cure of those not infrequently troublesome cases associated with pathological conditions of the lachrymal passages.

It is almost needless to state, that in the great majority of these cases, there is nearly always some interference with the proper performance of the natural function of the parts, in carrying off the ordinary secretions of the eye into the nasal fossa. This obstruction is usually situated in the nasal duct, and is sometimes due to congestion and thickening of the mucous lining membrane there, but in the great majority of instances, an actual narrowing of the bony lumen of the nasal canal is found in addition; this is most commonly situated at one of the extremities of the canal, the upper one by preference; seldom does it occur in any other part of its course, and more rarely still does it assume the form of complete blocking of the canal by bony formation. This obstruction causes retention of tears, which produces constant irritation, and frequently leads to a prolonged, and more or less chronic state of inflammation of the parts; it also greatly delays, or even occasionally entirely prevents, the cure of what would otherwise have yielded in most instances to the comparatively rapid and successful forms of treatment, ordinarily employed for combatting inflammatory processes elsewhere in the body.

If the bony lumen of the nasal canal is sufficiently enlarged to permit of the easy flowing away of the tears, this most important deterrent factor in the process of cure is got rid of, and the inflammation or other affection present, such as fistula, may be treated on ordinary surgical lines, with every prospect of a rapidly, successful and certain result.

My attention was first strongly directed to this matter by the case of a girl, aged 18 years, suffering from the usual symptoms of lachrymal obstruction; there were many cicatricial traces over the site of the lachrymal sac, and according to her statement, she must have been suffering from a fistulous opening there, for a period of about four years. There were traces elsewhere in her body, of many old glandular enlargements and suppurations. There was no stricture of either the upper or lower canaliculus, nor any apparent alteration in the condition of the lachrymal sac; but the opening of the nasal duct, leading out from the sac, was absolutely impervious, not even admitting the finest metallic wire when used as a probe, and only a very slight depression marked its site.

On September 7, 1896, I passed an ordinary, small pointed drill, attached to a dental machine, along the lower canaliculus, which had been previously slit, and directing it exactly in the way in which a lachrymal probe is introduced, tilted it, so as to bring its point to rest vertically on the slight depression already mentioned; the machine was then set in motion, and the drill, still carefully directed, passed through a layer of bony tissue, 3 mm. in thickness, and emerged into the remaining unobstructed portion of the nasal duct. The drill was withdrawn, and then three rose-headed burrs, respectively 2, 3, and 4.5 mm. in diameter, were successively attached to the handle of the machine, and made to pass through the newly formed passage, so as to sufficiently enlarge it.

The burr of 4.5 mm. diameter was the largest one procurable at the moment of operation, and seemed to me to be sufficiently ample in size, as this would appear to be the average caliber of the duct in the cadaver, although in life it is probably much narrower, owing to the presence of the venous plexus situated between the lining membrane and osseous wall of the duct. In the adult skull, the canal aperture is generally found to be oval in shape at its upper extremity, and if its narrower transverse diameter be measured, it will be seen that an opening of the above-mentioned size accords with the general average found, and therefore, should be quite sufficient to enable the parts to carry out their proper function satisfactorily.

As soon as the drilling was finished, the new passage and accompanying parts were syringed thoroughly clean of all debris, and a leaden wire of 2.5 mm. diameter was introduced as a style into the nasal duct. It was cleansed daily, and after the lapse of five days was exchanged for one of 1.75 mm. diameter, so as to afford ample scope for the growth of the tissue, which soon began to line the newly made passage. The style was constantly worn for a period of twenty-five days, giving rise to no unpleasantness, and at the end of that time was entirely dispensed with, the duct remaining perfectly patent.

The young woman has been seen at intervals since then, and there is no tendency shown of any recurrence of the occlusion again manifesting itself.

Since then, I have adopted the same principle in all cases of lachrymal affection where there is found to be any undue narrowing of the bony passage, and subsequently retaining the ground thus gained, by the wearing of a leaden style. The presence of this wire does not interfere at all with other forms of treatment, which are often necessarily employed at the same time; it allows the passage downward of the tears, quite as effectually when it is solid in form, as when grooved, and can also be more easily cleaned. It is always an advantage to have the style in as soft a condition as possible, because then it accommodates itself more readily to the shape of the passages, consequently giving rise to less irritation, and is also more comfortable for the patient to wear, a point which should always be considered as of great importance. This softening is very easily accomplished by boiling the style or piece of lead wire in water for a few minutes.

The new procedure which I have described is, of course, only applicable to those cases so frequently met with, in which there is distinct narrowing of the bony lumen of the nasal canal. In those instances where the lining of mucous membrane alone is at fault, either from congestion or hypertrophy, one must still advocate the use of sounds, passed in gradually increasing sizes, and combined with the wearing of a style.

The system here described of so rapidly and easily making a clean-cut passage, of any desired caliber which may be found necessary, for the downward conveyance of lachrymal secretion, must undoubtedly replace in ophthalmic surgeons hands, the customary practice hitherto employed, of trying to increase the lumen of the bony canal by the passage, more or less forcibly, of successive sizes of probes; the latter cannot be successfully accomplished except by fracture of bony structures or other injury, disturbing the anatomical relation of parts, and entailing a certain degree of reactionary inflammation, with increased tendency to cicatrization, and consequent contraction, or subsequent malposition of the disturbed parts.*

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* Reference to the proportions of the nasal duct and canal, may be found in Quain's Anatomy, 1896: also in a paper laid by Dr. Samuel Theobold, before the 8th Internat. Ophth. Congress.

THE VISUAL EFFECT OF THE REMOVAL OF THE LENS IN HIGH DEGREES OF MYOPIA.

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(Illustrated.)

When we remove an opaque lens from an eye, we do it only for the purpose of obtaining a clear pupil; we disregard the various changes the operation will produce on the dioptric system. Up to the year 1890, total or partial opacity of the lens was the only indication for its removal. In 1890 another indication was brought forward by Fukala, viz: To needle the lens for the cure of high degrees of myopia.

It was long known that a cataract operation performed on a highly myopic eye enables the patient to see distant objects without glasses much better than he could see them before in his myopic condition. But all oculists thought the risk of the operation too great in comparison with the benefit to be derived from a change of refraction. Only after the introduction of antiseptics was it permissible to endeavor to obtain the great advantage that the removal of a clear lens appeared to promise in cases of a high degree of myopia. It also became a matter of special interest to study the changes the operation causes in the refraction, the retinal image, the circles of diffusion, etc., the more so, as Fukala had already observed in his first cases, that these changes were far greater than had been expected.

The present paper is a result of this study. It will show with what degree of accuracy we can make a prognosis of the operation, and what rules for practice we may deduce from theoretical considerations.

The removal of the lens:

1, diminishes the refraction of the eye.

2, increases the size of the retinal image.

3, brings the pupil nearer to the retina.

4, eliminates all irregularities due to the refraction of the lens.

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*For more details I must refer the reader to the handbooks on Ophthalmology and Physiological Optics.

5, destroys the faculty of accommodation.

The dioptric system of the normal eye* has two principal planes, of which the second is situated about 2 mm. behind the apex of the cornea, and two nodal points very near the posterior pole of the lens and the center of curvature of the cornea. If the lens is removed, refraction takes place only on the anterior surface of the cornea (its posterior surface has so little influence on refraction that we may neglect it for practical purposes). The lensless eye is therefore represented by a single refracting surface, and the principal plane (there is only one in a single surface) must coincide with the apex of the refracting surface, the nodal point with its center of curvature.

Removal of the lens, therefore, will not only increase the focal length of the eye, but will also displace the (second) principal plane and the (second) nodal point. In the schematic eye the former is advanced about 2 mm., the latter brought 0.4 mm. backward. This displacement is of great influence on the refraction after the operation. The loss of refraction produced by the removal of the lens increases with the length of the optic axis, if the refraction before and after the operation is calculated from the corresponding principal plane; it diminishes with the length of the optic axis, if the refraction is calculated each time from the nodal point.* The variability of the loss of refraction is greater, when calculated from the principal plane, than when calculated from the nodal point, because the displacement of the principal plane is greater than that of the nodal point.

If the dioptric system itself is not normal, if, for instance, the radius of the cornea is unusually large, or the distance of the lens from the cornea unusually great, (the anterior chamber unusually deep) then also the displacement of the principal plane will be greater, and the loss of refraction will be even more variable than in the schematic eye. But whatever the condition of the optic system may be, the displacement of the nodal point will always be less than the displacement of the principal plane. It is therefore advisable to measure the refraction of the myopic eye, to be operated upon, from the nodal point, because the unavoidable error due to the inconstancy of

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*Compare Schön's paper in *Centralblatt f. praktische Augenheilkunde*, January, 1897, and my paper in *Archiv f. Augenheilkunde* von Knapp und Schweigger, Vol. XXXIV.

the loss of refraction is least in this method of calculation.

But where is the nodal point of the myopic eye? It almost coincides with the center of curvature of the cornea. If we know the radius of the cornea and the distance of the correcting glass from the apex of the cornea (which can easily be measured), we have only to add these two to the focal distance of the correcting glass, and the sum will give the distance of the far point from the nodal point as correctly as it is possible to obtain it. The inverse of this sum will indicate the true degree of myopia (measured from the nodal point) and must be the base of our further calculations and operative treatment.

The *loss* (R) of refraction (*i. e.* the number of dioptrics, which must be subtracted from the true degree of myopia to get the refraction after the operation), now depends upon the posterior focal distance of the cornea (f_2), the distance of the first principal plane of the lens from the cornea (d), the focal distance of the crystalline lens (F) and slightly varies with the length of the optic axis. If we neglect the last, the loss of refraction is found by the following formula:

$$R = \frac{f_2 - d}{f_2\ F}\ *$$

In the schematic eye (of Tscherning) the value of R equals about 13.5 dioptrics. An increase of the focal distance of the cornea (flat cornea) increases the loss of refraction also; a deeper anterior chamber on the contrary diminishes the loss of refraction, and a smaller focal distance (a higher refractive power) of the lens increases the loss of refraction. A flat cornea and a deep anterior chamber will more or less neutralize each other in their effects on the loss of refraction, whereas a flat cornea and a shallow anterior chamber will sum up in their effects.

To make an exact prognosis of the operation in a particular case of high degree of myopia, we must not only determine the degree of refraction in the manner explained above, but we must also know the focal distance of the cornea, the depth of the anterior chamber, and the focal distance of the lens.

The focal distance of the cornea, as well as the radius of its curvature, can be deduced from the refraction of the

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[*] This formula is obtained by transformation of the formula II. of my paper in Knapp-Schweigger's *Archiv*.

cornea. The ophthalmometer of Javal (or Kagenaar) indicates the refraction of the cornea, *i. e.* the inverse of the anterior focal distance (f_1.) Now to get the radius (r), we have to divide 0.3365 by the refractive power of the cornea ($D = \frac{1}{f_1}$) according to the formula

$$r = f_1 \, (n-1) = \frac{n-1}{D} = \frac{0.3365}{D}$$

and to calculate the posterior focal distance (f_2) of the cornea, we have to divide 1.3365 by the corneal refraction according to the formula,

$$f_2 = n f_1 = \frac{n}{D} = \frac{1.3365}{D}$$

The anterior chamber also can be roughly measured by means of the ophthalmometer; only to do so, it is necessary to have Antonelli's* scale at the foot of the instrument. The prisms are removed from the tube of the instrument in order to get a single and more intense image, and a lamp is placed near the eye to be examined in such a manner as to throw its light on the iris and to cause a contraction of the pupil. The patient's head is carefully fixed by an assistant.

I then proceed in the following way: I first focus the image reflected from the cornea, (viz: the image of the white figures on the arc). As the cornea is a convex mirror, the reflected image is virtual and behind the apex of the cornea. Now, the distance of the object (the arc of the instrument) from the cornea is so great in comparison to the corneal radius, that the reflected image may be considered as lying in the catoptic focus of the cornea, that is one-half of the length of the corneal radius behind the apex of the cornea, that is one-half of the length of the corneal radius behind the apex of the cornea. In a normal eye with 8 mm. radius of the cornea the reflected image is 4 mm. behind the apex of the cornea.

I then focus the pupillary margin of the iris. The iris does not appear in its real place, but seems slightly magnified and a little advanced by the refraction of the cornea. (If the anterior chamber is 3.6 mm. deep, it will appear

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*Antonelli (*Archives d' Ophtalmologie*, XI., page 529.) used it to measure the degree of exophthalmos.

only 3.2 mm. deep, with a normal radius of the cornea of 8 mm). The scale at the foot of the instrument will give the distance between the position of the reflected image of the cornea and the apparent position of the iris. In a normal eye the instrument must be drawn backward about 1 mm. to get a distinct image of the pupillary margin after having focused the reflected image of the cornea. In highly myopic eyes I often found the reflected image and the pupillary margin in the same plane, or almost so; this always indicates a deep anterior chamber.

Of course this method, like all other methods of measuring the anterior chamber, only gives the apparent depth of it. The true depth can be found by the formula

$$\frac{1}{b} = \frac{1}{f_2} + \frac{1}{na}$$

wherein b indicates the true depth, f_2 the posterior focal distance of the cornea, n the index of refraction of the aqueous humor (1.3365), a the apparent depth of the anterior chamber, as obtained by the method just described.

It is not always necessary to calculate the true depth of the anterior chamber; with some practice it can be estimated with sufficient accuracy. In making such an estimate the observer should not forget, that a less curved cornea produces a greater difference between the true and the apparent depth of the anterior chamber, than a more curved one.

Thus far, the examination of the eye to be operated on may be made with the instruments, ordinarily at the disposal of the oculist. But the determination of the focal distance of the lens necessitates the use of the ophthalmometer of v. Helmholtz, the manipulation of which requires particular skill, and a considerable knowledge of mathematics. For the ordinary practicing oculist it is then impossible to determine the refractive power of the lens.

Hence, it is evident that a good deal of uncertainty attaches to our prognosis. All our calculations are based on a normal refractive power of the lens. When Fukala published the results of his first operations, he thought that an increased refractive power of the lens is common in high degrees of myopia, because the loss of refraction after the operation for myopia is so much greater than it is after the extraction of a cataract from an emmetropic eye. But Schön has shown that the variability of the loss of refraction, due to the elongation of the optic axis, explains most of these cases. Nevertheless, there are cases in which the refractive power of the lens is increased, most probably because its surfaces are more curved. We are justified in assuming this, when the loss of refraction is, after considering all other things that may be of influence, uncommonly great; but we have no means of arriving at certainty in this matter before the operation. Yet the unquestionably reliable observations made up to the present time of abnormal lens refraction and theoretical considerations, permit us to assume that *only* an *increased* refractive power (a shorter focal distance) of the lens is likely to be found. An abnormal refractive power of the lens, therefore, can considerably *increase* the loss of refraction. but it is not likely to diminish it. Our calculation then gives us the *highest* degree of refraction to be expected after the operation, and leaves the possibility of even a much less degree (less myopia or greater hypermetropia.)

The prognosis of the operation will, therefore, be best at all events in the highest degree of myopia. Our calculation shows that in these a certain degree of myopia will be left. In cases in which the loss of refraction turns out greater than we calculated in advance, the patients may become emmetropic, or slightly hypermetropic; but if we operate for a myopia of about 14 dioptries which will, according to the theory, be transformed into emmetropia, we must not forget, that possibly also, a rather high degree of hypermetropia may result.

The patient suffering from a high degree of myopia has to choose between a complicated treatment, including two or three operations, which will keep him from his work for several weeks, or even months, and the simple fitting of glasses. He will of course choose the former, only if it will enable him to see distinctly without glasses. He will be in the condition best adapted for our modern occupations, if after the operation a slight degree of myopia (about 2 to 3 dioptries) still remains.

The acuteness of vision is increased by the operation. This is due partially to the larger retinal images of distant objects the eye has after the operation. If the myopic eye looks at a distant object through its correcting glass, the posterior nodal point is thrown backward, and the more so, the stronger the correcting glass, and the farther it is placed from the eye. The posterior nodal point remains in its normal position when the eye looks at an object within its natural range of accommodation. The size of the retinal image is proportional to the distance of the nodal point from the retina. The retinal image is, therefore, comparatively smaller when the correcting glass is used. After the operation the nodal point (very nearly) retains its former position. The retinal image will consequently be of the same size as it was before without the glass, therefore, the acuteness of vision after the operation *should* be the same as the acuteness of vision that existed within the natural range of accommodation before the operation, that is, the same as the relative acuteness of vision (Donders).

We have no means of determining directly the relative acuteness of vision before the operation, because our test-types are much too large for the short distance in which the highly myopic eye is able to see. But we can easily calculate it from the distance of the correcting glass from the nodal point. If d is this distance, Vr the relative, Va the absolute acuteness of vision,* and γ the focal distance of the correcting glass, we have the proportion:

$$\mathrm{Vr} : \mathrm{Va} = \gamma + \mathrm{d} : -\gamma$$

In the cases in question, when the correcting glasses occupy their usual position, the value of Vr : Va equals about 1.5. This value will, of course, increase, when d becomes larger, viz., when the nodal point is farther back, or when the corneal radius is larger.

All we have said, however, does not explain the great improvement of vision that has been observed in so many cases after the operation. I do not allude to those for which even a tenfold improvement of vision has been claimed; they will hardly bear accurate analysis. But cases of a twofold and threefold improvement of vision have been observed by so many operators, and under circumstances so different, that they cannot be called in question. Other physical conditions, therefore, must be of influence besides the size of the image.

Increased brightness (intensity) of the retinal image cannot be one of these conditions, for it always remains the same, as Leber† has recently shown. It is true, that a larger pencil of rays of light falls into the operated eye, but the retinal image is larger in the same proportion. Tchanz* has called attention to another fact that may perhaps be of great influence. The aphakic eye is practically formed only of *one* refracting surface, with a *homogeneous* medium behind it, whilst in the eye with its lens three surfaces and two media are present, and besides, the lens substance is formed of different layers, each of which has a radiating structure. We know that the irregularities which appear in the circle of diffusion and cause the physiological polyopia (Donders) are due to this structure of the lens. So far as my experience goes, subjective astigmatism which does not correspond with the ophthalmometric examination, is rather often found in eyes with high degrees of myopia. Myopic patients also obtain their maximum of vision with a glass weaker than their real degree of myopia (as found by the shadow test for instance) would require. This shows (compare my paper on the vision in diffusion circles†) that the function of the retina is much better than we estimate it to be by our test, and that there must be some irregularity of refraction that produces diffusion circles and cannot be corrected by glasses.

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*That is, the acuteness of vision for distant objects when the error of refraction has been corrected.

†*Archiv. f. Ophtalmol.*. XLIII. 1, page 218.

In removing the lens we probably remove the source of these irregularities of refraction. The vision is improved, therefore, partly by increasing the size of the retinal images, partly by simplifying the dioptric system. Adopting this explanation, we need not take refuge in the view of v. Hippel, that the function of the retina is improved, or in the view of Fukala, that the vision for distance becomes better by exercise.

The aphakic eye is entirely destitute of accommodative power. Though sometimes a certain small range of accommodation may be observed, a careful examination always shows, that this depends only on the faculty of seeing in circles of diffusion. I cannot enter into the theory of this faculty here, and I must, therefore, refer the reader who is interested in this subject to my paper before referred to. I will state one fact only: The possibility of distinguishing objects, that form no distinct images on the retina, does not depend only upon the size of the

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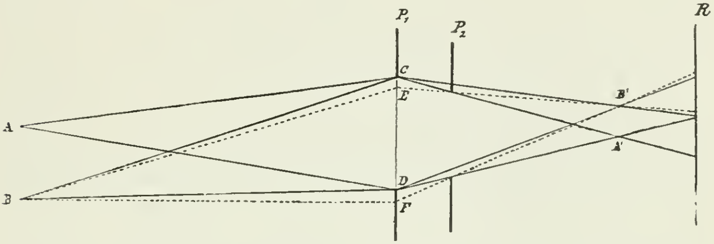
***Archiv. f. Ophtalmol.* XLI. 1. page 109.

† *Archiv. f. Ophtalmol.* XXXIX. 2, page 83, and XL. 5, page 102.

circles of diffusion, but also upon their distances from each other on the retina.

The following diagram shows how two pupils, one in the principal plane and the other behind it, produce circles of diffusion of the same size, but of different distances from each other.



Let A and B be two luminous points, and A^1 and B^1 their images. If the pupil is in P_1 (the principal plane) the pencil of rays uniting in B^1 is CDB^1. If the pupil is in P_2 (it must be a little smaller there to get the same size of diffusion circles) the pencil of rays uniting in B^1 will be EFB^1, which forms a larger angle with the pencil CDA^1 than the pencil CDB^1 forms with it. If the retina is in R, the diffusion circles will be farther apart with a pupil in P_2, than with a pupil in P_1. This position of the retina corresponds to myopic refraction. The reverse would take place if the retina were in front of the points A^1 and B^1 corresponding to hypermetropic refraction.

The conclusion we can draw from this diagram is: As regards the vision without glasses an aphakic eye with myopic refraction can see comparatively better than an aphakic eye with hypermetropic refraction.

Everything considered, we must say that the most desirable effect to be realized by the removal of the lens for myopia consists not in making the eye emmetropic, but in leaving it slightly myopic (by 2 to 3 dioptries). Patients in whom this result has been obtained will see sufficiently well at very great distances, even without glasses; at the distance of from 50 to 33 cm. they will see quite distinctly, and at shorter distances also they will be able to see moderately well by making use of the faculty of seeing in diffusion circles, a faculty that, according to the observations that have hitherto been made, is developed to a high degree in myopic eyes. Such patients, though they have no accommodation at all, can get along very well without glasses. Not so with patients that have become emmetropic after the operation; their diffusion circles are too large to permit of reading, and they are obliged to use glasses.

One thing we should never forget when we advise a patient to be operated upon for myopia, and that is, that the operation will improve his sight for distance, but impair it for near objects. For it must be regarded as an impairment of vision to be obliged to wear glasses in an occupation in life which could be followed before the operation without the use of glasses. And even glasses will not adapt eyes operated upon for myopia for so short a distance as was their previous far point, and accordingly such eyes will not be able to make out minute objects as well as they could before. Persons whose occupation requires them to use their eyes almost entirely on close objects, will derive but little benefit from the operation for myopia; indeed, some such cases are known who regret bitterly the loss of their near vision.

On the other hand, there are persons that by their position in life are at a great disadvantage in consequence of myopia, and on whom the operation will confer a great benefit, the extent of which we are unable to estimate accurately. In no operation, perhaps, should the social and educational condition of the patient be so carefully taken into consideration as in the one in question. It would be a great mistake to base the indications for the operation solely upon a certain degree of refraction. But above all, the oculist should bear in mind, never to operate in cases of too low a degree of myopia.

PARTIAL DETACHMENT OF THE SUPERO-TEMPORAL VEIN OF THE RETINA.

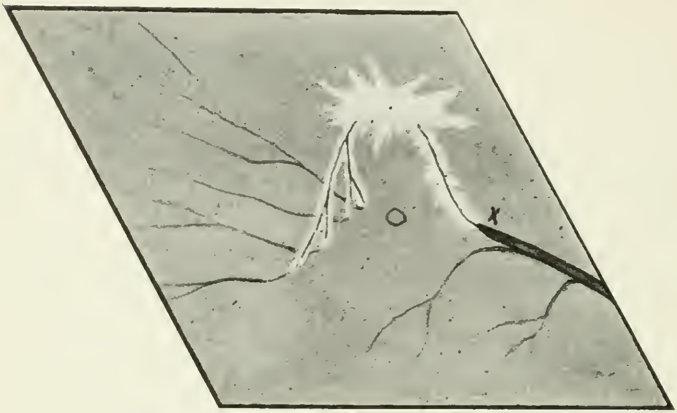
BY JOHN DUNN, M. D.,

RICHMOND, VA.

In the *Archives of Ophthalmology*, Vol. XXV., No. 1, p. 106, I reported a case where, as the result of choroido-retinitis, there existed a partial detachment of the infero-nasal retinal artery. In the following case there exists a partial detachment of the supero-temporal vein, together with some of its branches, and the accompanying intra-ocular changes seem to throw some light upon the mechanism of the production of partial vascular detachments.

Mr. G., aged 32, had in O. D., in 1891, an inflammation which resulted in the loss of useful vision. He first came under my observation on July 15th, 1895, having then for the past four or five days noticed a small moving body before the left eye which, up to this time, had given him no trouble. Examination of this eye revealed half way between the disc and macula a small hemorrhage from the macular artery from the disc, together with slight œdema of the retina, about the seat of the hemorrhage. There was also noticable œdema in the region of the macula. Vision $^{18}/_{25}$. Examination of O. D. revealed extensive retinal degeneration, together with a small and a large opacity in the vitreous. These opacities being evidently the result of hemorrhage and the vision useless. No minute examination was made of them. Under treatment the acute inflammatory symptoms, O. S., disappeared, and the vision returned to normal.

In March, 1896, Mr. G. again had trouble with the left eye. At this time there existed œdema about the seat of the former hemorrhage, together with hemorrhages and œdema from two branches of the supero-temporal vein; central vision was very little interfered with. This trouble again disappeared under treatment. Our patient was again seen in October, 1896. At this time, almost centrally in the vitreous, was a faint cloud consisting of fine dust-like opacities. The origin of this could be seen in an inflamed spot, occupying the lower and outer third of the disc. Here there were minute hemorrhages with œdema. No trace could be found in the fundus, either of the old inflammation or of other newly inflamed areas in the retina. Being at this time specially interested in the after history of intra-ocular hemorrhages, I carefully examined the condition of O. D. The most noticeable features were two opacities in the vitreous; one, situated directly behind the lens, was of the usual non-refracting cob-web variety to be seen in old cases of degenerated vitreous, and differed entirely in appearance from the fixed one about to be described. The fact that this second opacity was immovable showed that we had not to do with fluid vitreous. Highly refractive, it was under bright illumination of almost snowy whiteness, resembling in color and appearance a fleecy cloud, such as is at times seen in a clear sky (see the accompanying illustration). The surface of this opacity could be distinctly seen with



Partial Detachment of Supero-Temporal Retinal Vein.

a + 8 D. It was very irregular in shape, having several long projections, in color and appearance similar to the main body. These projections had free ends in the vitreous. As the lenses in the ophthalmoscope were, one by one, changed through the scale from + 8 D. to O., at the same time making the patient change the position of his eye slightly, it could be seen that this white body in the vitreous, large at the top, was connected with the fundus by four roots, calling to mind the pictures of the banyan tree. Each root terminated in a vein. On examining the course of the superior temporal vein from the disc toward the periphery, the vein could be seen to lie in the retina up to its third bifurcation, which was situated slightly external to and considerably above the region of the macula. Beyond its third bifurcation the vein was seen to leave the retina and come directly forward into the vitreous as thè trunk of the opacity. Shortly atter leaving the retina it was markedly thinned and surrounded by a broad white sheath three or four times its own diameter, in color and appearance identical with the large opacity above mentioned. This vein, surrounded by its sheath, could be traced to a point beneath the center of the summit of the opacity, from which point there extended at different angles, downward into the retina, two white projections, both of which bifurcated before it reached the retina. In the center of each of these projections could be seen a dark streak, which was a branch of the supero-temporal vein. After entering the retina these attenuated veins could be followed for a considerable distance.

The retina was nowhere detached, and could be seen in its normal position between the ascending and descending projections above referred to, and beyond them as far as the visible limits of the fundus. The picture presented by the fundus itself is the result, probably, of repeated hemorrhages caused by disease of the retinal vessels. The veins, it would seem, are chiefly the seat of these degenerations. The temporal half of the retina is the part in which most changes have taken place. About the macula can be seen very minute whitish areas; these areas are very much smaller than are seen in cases of acute albuminuric retinits. Over this whole half of the fundus there has been much disturbance of the retinal pigment, although in only a few places has it been massed so as to form black blotches, and these are small. There is no atrophy of the choroid. In two or three places there are striations in the retina. The most marked one of these lies in the inferior half of the fundus. It is about three or four Ods in length. It crosses the fundus transversely; in general, it is about the width of the inferior retinal vein; it is largest at the external end where there is a dilatation; there exists, also a dilatation about its middle; in color it is a light gray; there is a slight deposit of pigment along its edges, with evidences that there have been disturbances in the adjacent retina; this streak, and a larger one similar to it, though less well defined, and which is to be found between the macula and the disc, lie beneath the retinal vessels and resemble certain of the striations mentioned by Holden in his article on *The Hemorrhagic Origin of the Striated Affections of the Retina* (*Arch. Ophth.*, Vol. XXIV, p. 14). The health of Mr. G. is excellent, examinations failing to reveal any evidences of kidney, heart, or other disease.

We have here a case of disease of the retinal vessels, in which there has resulted a forcing forward of a segment of a vein with its branches into the vitreous. Consideration of the condition here found seems to explain how a partial detachment of a vessel without detachment of the retina can occur. Hemorrhage from a large vessel takes place in considerable quantity, and thus a rent is made in the overlying retina and hyaloid. The blood accumulating about and behind the vessel forces the latter through this rent forward into the vitreous. The hemorrhagic extravasation, save the fibrinous portion, is later absorbed. The fibrin remaining about the vessel and attached to it prevents the return of the vessel to its bed as absorption of the hemorrhage proceeds. In the case where I reported a partial detachment of a retinal artery, I was willing to refer the detachment, in part at least, to the motion communicated to the vessel by the passage of blood through it. This explanation seems inapplicable in the case of the vein. In a P. S. to my former article the suggestion was made that possibly a part of the retina had originally been detached and had afterward become re-attached, leaving the artery separated. This suggestion was brought up by the choroidal involvement in the former case. I now think these hypotheses wrong, and that the above case offers the true explanation of partial detachment of the retinal vessels, whether veins or arteries. It is to be noted further that in the case of the artery the lumen of the detached portion remained patent, while in the case of the vein the detached portion atrophied, the remaining portion of the vein remaining pervious. The existing condition is very well shown in the illustration made by Dr. John W. Brodnax, of Manchester, Va. The fibrin about the descending branches of the vein surrounded them for some little distance after they had again reached their places in the retina. The possibility that we have here to do with a case of detached retina suggests itself, and, indeed, this diagnosis had been made by the first oculist whom Mr. G. consulted about his eye. Careful examination of the picture presented will, however, show, I think, that such is not the case. In the first place, the *large* white mass seen in the vitreous is structureless, has on its surface no trace of any blood vessel; has descending from out of its body no vessels, save the atrophied veins above described. There is no trace of any blood vessels in any of the surface projections. Again, this highly refracting mass is a body *per se*, it occupies a definite, fixed place in the vitreous. It is incorporated into the substance of the vitreous; it is anchored, so to speak, and does not float about with movements of the eye. It is forward in the vitreous, I should judge, at least one-half or three-quarters the distance from the back of the lens to the macula. Beneath it, between the ascending and descending branches of the detached vein (at O. in the figure), the retina can be seen occupying its normal place on the fundus of the eye. Externally and internally to it, *i. e.* everywhere, the retina lies in place as far as the visible limits of the fundus. Where the larger vein leaves the retina (via X. in the figure), the retina on either side of the vein does not leave its place on the fundus. Again, the atrophied, dislocated veins reach forward only as far as the posterior aspect of the fibrinous mass in the vitreous; they do not pass over its anterior surface, as they would do were we dealing with a partially detached retina.

SARCOMA OF THE LACHRYMAL GLAND.

By Kenneth Scott,

LECTURER ON CLINICAL OPHTHALMOLOGY. EGYPTIAN GOVERNMENT
MEDICAL SCHOOL; OPHTHALMIC SURGEON KASR-
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Although cases similar to the following are not exceedingly rare, they are still sufficiently so to merit their occurrence being recorded.

The patient was a young unmarried woman, 18 years old; she was a street vendor, and a native of Cairo, Egypt. Nothing abnormal could be elicited either about her own history, or that of her family. She was of medium height, well developed and showed no signs of emaciation.

On April 9th, 1896, when she first came under my observation, there was marked drooping of the right upper eyelid and distinct prominence of its temporal half. She had become aware of this swelling about two months previously, and since then had noticed its steady, though painless growth.

On close examination a dark, general pigmentary discoloration was evident in the skin of both upper eyelids, denser in that of the right eye, where there was also well marked ptosis. The globe of this eye was displaced 15° downward, as measured by the perimeter; there was great restriction in its movement of rotation upward, but none in any other direction.

A firm, sharply defined, almond-shaped tumor could be felt, lying horizontally below the outer half of the upper margin of the orbit, its edges were rounded and its cortex seemed to be roughened. The horizontal diameter of this swelling was 22 mm.; its greatest vertical diameter, measured at the outer $\frac{3}{5}$ of the orbit, was 11 mm.; its proptosis, as compared with the position of the left eye, was 10 mm.; the posterior limit of the growth lay beyond the range of palpation under the orbital roof. The tumor seemed to be freely movable, and was painless. Lying immediately below it was apparently another small growth, which was equally hard, distinctly separate, and seemed to be independently movable; at the time of operation no trace of this appearance could be found.

The other eye, the left one, also presented a distinctly localized and firm, though much smaller swelling, in an exactly similar position, but which did not project beyond the bony edge of the orbit; there was no displacement of the globe of the eye, nor any interference with its movements. The eye showed a divergent strabismus of 30°; there were nebulæ on its cornea, and its vision was only $\frac{2}{36}$, as compared with the other eye affected with the tumor, which had $\frac{6}{6}$. There was no apparent alteration in the function of lachrymation in either eye, nor enlargement of any other glands in the body generally.

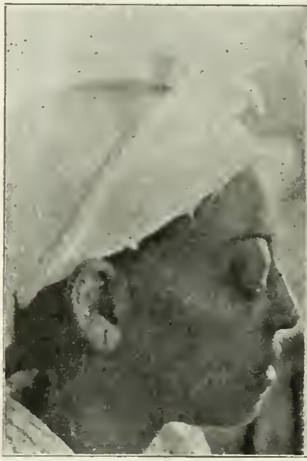

Fig. 1. Right Eye—Patient looking horizontally forward, as in fig. 2.

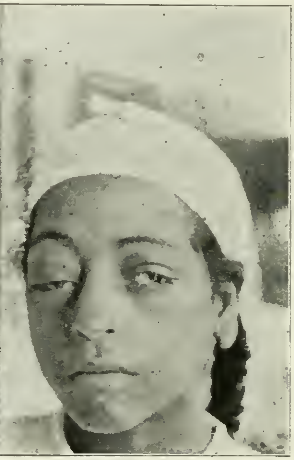

Fig. 2. Right Eye—Showing downward displacement of globe.

The patient was kept under careful observation for 34 days, when, notwithstanding mercurial inunctions and the internal administration of iodide of potassium, etc., the tumor related to the right eye became steadily larger; its proptosis from being 10 mm. had increased to 16 mm., causing 24° of downward displacement of the globe, instead of 15°, as when formerly measured. I accordingly determined on operation, as this had now become the only expedient. I exposed the tumor through a horizontal incision along the upper eyelid, parallel to and just below the eyebrow, and transfixed it by a ligature so as to draw it forward and facilitate dissection during its removal.

When this was completed, the globe was at once released from its downward displacement and immediately assumed its normal position. The wound was thoroughly washed, a catgut drain inserted, and the opposing layers of divided tissue carefully brought together; the last being apparently successfully done, as there was no occurrence of ptosis after the removal of the stitches on the sixth day.

The tumor proved to be of hard consistence, and was quite sharply defined from the surrounding tissues; there was no differentiation into lobes, and its surface was comparatively smooth and even. It measured 37 mm. in extreme length, 30 mm. in breadth, and 10 mm. in thickness; (the normal gland is said to average 20 mm. in length, 10 mm. in breadth, and 5 mm. in thickness). Its weight was 7 grammes. On section it was firm and resembled yellow fibro-cartilage; its microscopical examination, kindly made for me by Dr. Ruffer, showed it to be large round-celled sarcoma.

I thought it advisable, considering the nature of the tumor removed, to examine more closely the lachrymal gland of the other eye, which was still ultra-prominent. This was accordingly exposed through a linear incision, and, although found to be larger than usual, it seemed to be of ordinary consistence; as no increase in its size had been noticed during a period of 60 days, its removal was considered unnecessary.

On inquiry 10 months later, it was found that the patient is still in excellent health, and that there is no recurrence of the tumor growth removed, nor enlargement of the lachrymal gland of the other eye, which was left *in situ*.

Further than the case mentioned by Mr. Bronner in the Trans. Ophth. Soc. of U. K., 1896, investigation of all available resources has not enabled me to increase the number of references to similar occurrences, which may be found in the list appended to the description of two cases by Messrs. Lawford and Collins in the Roy. Lond. Ophth. Hosp. Reports, Vol. XIII, part 4.

SCOPE AND LIMITS OF OPHTHALMOMETRY (KERATOMETRY).

By Thomas Reid, M. D.,

GLASGOW, SCOTLAND.

Ophthalmometry, which has contributed so largely to place physiological optics on a sound physical basis, has now, thanks to the labor of Javal, Martin and others, a recognized place in practical ophthalmometry and justly so, because now when greater attention than formerly is bestowed on refraction, an exact knowledge of the form and dimensions of the surface of the cornea (at which the chief refraction of the eye is effected) is indispensable for the intelligent appreciation of the complicated phenomena manifested in the anomalies of accommodation and refraction. And if the ellipsoidal form of the corneal surface as a whole, which had been assumed on insufficient grounds and apparently confirmed by incomplete data, has been questioned by the investigations of Aubert and others, still Aubert has found in the central area (that available for vision,) that while its curvature cannot be referred to any of the conic sections, the principal meridians can most conveniently be compared to a spherical surface.

In carrying out investigations of this kind, on account of the mobility of the eye, the elasticity of the cornea and its extreme sensibility, as well as its small radius of curvature, the usual physical methods for determining the curvature of surfaces cannot be employed here.

Dr. Thomas Young, in 1801, by an ingenious method of self-observation, succeeded in determining the height of the bulge of the cornea, and the vertical cord of the base having been previously measured by the usual geometrical methods he determined the curvature of the cornea, assuming it to be a spherical surface. Considering the roughness of the method the result obtained in measuring his own cornea (7.87 mm.) was probably very near the truth. Kohlrausch was the first to adopt the method of determining the radius of curvature by the measurement of the size of a corneal image of a known object, at a known distance, seen through a telescope with a micrometer eye-piece.

Helmholtz, with a perfect appreciation of the conditions of the problem, devised his ophthalmometer, and by the well-known method of double images was able to get rid of the disturbing influence of the mobility of the eye and the difficulty of executing the micrometric measurement of Kohlrausch. With his improved instrument he was able to measure the virtual image on the cornea of an object of known size and diatance, and consequently to determine the radius of curvature of different parts of the cornea.

There are two conditions which must be fulfilled in this method:

1. The size of the image must have a definite relationship to the radius of curvature of the cornea, *i. e.*, it must be so small that the spherical aberration will not vitiate the result.

2. The normal of the surface examined must coincide with the optical axis of the instrument used. Assuming these conditions to be fulfilled, the accuracy of the results obtained by the instrument will then depend upon the degree of refinement with which the requisite measurements can be carried out.

We will now discuss these conditions in greater detail.

With Helmholtz's ophthalmometer as employed by Woinow, with an object of 500 mm., situated at 1.25 m. distance, the object giving an image averaging about 1.5 mm. an approximately accurate result might be obtained. In the recent observations of the late Prof. Aubert on the accuracy of the results obtainable with the most perfectly constructed instrument, with a special form of illumination, with an object of 100 mm. size and 1,000 mm. distance, giving an image averaging .5 mm., the approximation to the true radius would be still closer, assuming that the instrumental error could be neglected. As a matter of fact Aubert found on the measurement of his own eyes, and those of Westien, that there were differences in the results obtained on different days. In order to bring the matter to a test as regards the possible variations of curvature of the cornea, Aubert substituted a glass lens of 10 mm. radius. On making a number of consecutive observations under the same conditions he obtained very different readings. He inferred from his experiment that these differences must be due to to a personal error of observation.

Recent observations made with a Myersteins instrument by the author and other observers, with a micrometer reading to the $\frac{1}{1000}$ of an inch and at the usual distance of 1 m., with the view of testing this point have shown that a variation of the size of the image of 1 mm. could not be detected, owing to the smallness and distance of the object. This error, amounting to .1 mm. for the images of 1 and 2 mm. respectively, would, therefore, be twice as great with the results obtained with the smaller image. This shows the extreme difficulty of arriving at accurate results, when the quantities dealt with are so very small; indeed, Aubert suggested to meet this difficulty that the telescopic part should be more powerful. With the Javal's and the portable ophthalmometer, where the doubling of the images is obtained by means of a Wollaston prism, the object glass of the instrument must be perfectly aplanatic so as to focus exactly at the same distance, otherwise the size of the image will vary, a condition not necessary with Helmholtz's instrument, where the size of the image is constant for all distances.

With Helmholtz's ophthalmometer and with the principal meridian of the cornea sufficiently regular, an image of 1.5 mm. will as a rule express with sufficient accuarcy the relative refraction of the cornea in these meridians. With images of a larger size spherical aberration is increased to such an extent as to vitiate the calculations.

With Javal's instrument with an image of 3 mm. and with the portable ophthalmometer with an image of 2 mm., it is clear that from the spherical aberration the absolute size of the radius cannot be determined without reduction, as Leroy has done. Hence, the necessity in these instruments of being adjusted to a spherical surface of known curvature, which at most expresses approximately the average curvature of the cornea.

The results obtained by these instruments thus adjusted, although not theoretically perfect, will give the relative difference in degrees of corneal astigmatism not greater than 5 diopters with sufficient accuracy for practical purposes.

Can the measurement of an image of a definite size in the visual axis only be relied upon as expressing the refractive power of the cornea in every case? If the measurement of the corneal surface be limited to one image on the visual axis, what size of an image will express accurately the refractive power of the cornea? If the corneal surface was invariably aplanatic in all meridians, and accurately centered, the size of the image would be immaterial; but when the area measured is non-aplanatic, as must be the case in astigmatism in one meridian at least, the measurement of an image of one size only in that axis cannot be relied on in astigmatism higher than 2 diopters for determining the refractive power of the cornea, and if there is an angle a coincidence of the normal, with the visual axis being absent, the results obtained are necessarily imperfect. Javal regards the error resulting from this omission as practically negligible.

In this case the conditions of accurate measurement that the radius of the part of the surface examined must coincide with the axis of the instrument can only be accomplished by two movements of the instrument, one of displacement and one of rotation, a condition difficult to be fulfilled by the larger instruments. With the portable ophthalmometer the existence of the angle *Alpha* is at once made manifest, and the requisite conditions for the measurement of the curvature of the surface are easily fulfilled, but here the part measured being necessarily out of the visual axis cannot be taken absolutely to express the refraction of the eye.

Whilst the physical difficulties of obtaining absolutely accurate measurements of the radius of curvature of the cornea seem at present to be insuperable, still when the curvature of the principal meridians of the cornea is more or less regular and the astigmatism not too high, the measurement obtained with the Javal and the portable ophthalmometer will, as a rule, express with sufficient accuracy the relative differences of the refractive power of the principal meridians.

Where the absolute astigmatism of the cornea, obtained by ophthalmometric measurement, differs from the total astigmatism as found by subjective and other tests, we are not justified in assuming the existence of lenticular astigmatism, from the difficulty of knowing exactly what area of the cornea is utilized in distinct vision in a given case. On the other hand, if the measurement of the cornea shows no astigmatism, but the shadow and subjective tests show an astigmatism against the rule, we may assume that there is a statical astigmatism of the lens probably caused by rotation on its horizontal axis, which, in some cases, may neutralize a corneal astigmatism. For example, cases occur in which a corneal astigmatism is found of 1 D. in one eye without subjective or total astigmatism, and in the other eye with no absolute corneal astigmatism, a subjective astigmatism of 1 D. against the rule.

This absolute corneal astigmatism, assuming that the part measured is the visual area, will, therefore, express pretty accurately the total astigmatism when there is no irregularity in the lens. In high degrees of astigmatism (say amounting to 4 or 6 D.) the results obtained by Javal and the portable ophthalmometer cannot be relied upon by measurement of one size of an image alone on account of the great differences of eccentricity of the ellipses of the principal meridians.

In these cases a more correct result would probably be obtained by using an image of not more than 1.5 mm. for the meridian of greatest curvature.

In cases where the astismatism is irregular, as a result of previous inflammation involving the anterior elastic lamina of the cornea, the ophthalmometric measurement will not express accurately the total astigmatism, but in many of these cases the vision may be improved by the use of cylinders. In extreme cases of irregularity, such as conical cornea, the central part, which by preference is utilized in optical instruments, is not as a rule improved by cylinders, but the more peripheral parts still within the visual area, where the irregularity is not so great, may be utilized for vision more or less perfect.

In these cases the ophthalmometer is of value as showing at once the conditions with which you have to deal and the degree of improvement which may be expected in a given case.

We have already noted the existence of a statical lenticular astigmatism against the rule and generally found in myopic cases. This astigmatism against the rule is not always to be referred to the lens, as was once supposed to be the case, but may reside in the cornea. When regular it can be perfectly corrected by a suitable cylinder. On the other hand, when the astigmatism of the lens is irregular, with a perfectly regular cornea, the principal meridians will not, as a rule, be perpendicular to one another nor constant in their position. This form of astigmatism, as might be expected, is less amenable to treatment by lenses, and is generally attended with acute neuralgic pain, owing to the efforts constantly made to find the circle of least confusion.

Whilst these conditions may exist individually, two or more of these irregularities may be combined in a single case, and hence the ophthalmometer is valuable in analyzing the different elements which contribute to form the total astigmatism.

From the physical difficulties of accurate measurement of the radius of curvature of the cornea, and the uncertainty as to the exact area utilized in distinct vision, it is evident that glasses cannot be prescribed on the basis of the ophthalmometric measurement alone, but recourse must be had to other methods also, such as the shadow test, and particularly to the subjective testing by means of the usual test.

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GOUT AND RHEUMATISM AS FACTORS IN THE ETIOLOGY OF GLAUCOMA.*

BY STEPHEN OLIN RICHEY, M. D.

WASHINGTON, D. C.

Within the past year an eminent colleague said to me: "I think iridectomy in chronic glaucoma is indefensible; but what *is* glaucoma?" Agreeing with him in regard to operation in chronic glaucoma, it is yet with some diffidence that I essay this consideration of the malady.

The least confusing presentation of the subject is under its two extreme forms, acute inflammatory glaucoma, and chronic simple glaucoma. All other varieties occur between these two, partaking more or less of the one or the other, due to the same cause, in differing degrees of intensity; including even so-called secondary glaucoma, which may be *secondary* to keratectasia, or fistula of the cornea, in which affections the support to the blood vessels of the fundus is diminished by the subnormal intraocular tension in the same way as by a mydriatic; to irido-cyclitis, or retinal hemorrhage, dependent upon gout; occlusion of the pupil, luxation of the lens, intraocular tumors, choroiditis, myopia; any of them may cause the increase of tension of a pseudo-glaucoma, but not the intra-ocular tension characteristic of true glaucoma. Secondary glaucoma has a definite local exciting cause, but there is also a constitutional predisposition, as in glaucoma following cataract extraction,

Propositions.

First. Increased intra-ocular tension in glaucoma is caused chiefly by distension of the blood vessels internal to the sclerotic; rarely, and to a slight degree, by derangement of intra-ocular secretion, or excretion.

Second. Associated with increased intra-ocular tension is high general arterial tension, or arterio-sclerosis, and pulsation of the intra-ocular arteries and veins; with at least functional disturbance of the heart.

Third. As a result of persistent venous stasis hyperplasia of connective tissue with substitution (substitutive fibrosis) takes place in all the tissues of the bulb.

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*Read May 4, 1897, in the Congress of American Physicians and Surgeons, at Washington, D. C.

Fourth. In chronic glaucoma the *materies peccans* of rheumatism cannot be excluded as a factor in causation; no reason appears for suspecting it of any agency in acute glaucoma,

Fifth. Every form of glcucoma is owing primarily to gout (or goutiness), or to acquired syphilis in its tertiary stage

Sixth. Iridectomy, the first violence of the attack being past, so reduces intra-ocular pressure as to permit the vena vorticosæ to be emptied, thus restoring the intra-ocular circulation and establishing normal tension. Any operation which lessens the surface pressure upon the vascular system within the eye, whatever the result, seems in reason open only to this explanation; for such vessels have no vaso-motor[*] system, and no power of contraction, but dilate and contract in response to the greater or less force of the extra-ocular blood current.

Intra-ocular tension in a normal eye is increased at every *pulse-beat*[†], and at every expiration; and is lessened during inspiration. By experiment, retardation of the venous outflow increases pressure in the vitreous, and lowers it in the aqueous chamber; the venous outflow being normal, a reduced arterial supply lowers tension, and *per contra*, shewing the control of intra-ocular tension by the intra-ocular, depending upon the general, vascular condition. To the hypothesis of a derangement of the functions of secretion and excretion as a cause of high intra-ocular tension serious, if not insuperable objections exist. although it has been accepted for many years as the best offered. It is based upon an assumption that "increased intra-ocular tension is the essence of the disease," and the cause of all its evils, and that glaucoma is purely local. It is unsatisfactory to one who has watched an attack of acute glaucoma from its manifest inception, unless he be willing to ignore the constitutional history and complications of the malady; or to one who has followed the progress of a chronic glaucoma through all its phases and modifications, not limiting his observation to the special local developments. The disease has been correctly defined as "a complex of symptoms," for the involvement of each component tissue of the bulb compels it to give voice to its distress. Though high intra-ocular tension is a cause of some of the other symptoms, derangement of intra-ocular secretion could not accomplish what we find in glaucoma. If there were at the same time increased secretion and retention, the intra-ocular contents, by the action of both, would only the more quickly reach a point short of the high tension of acute glaucoma at which the resistance to secretion would be too great for its continuance; for the secretion of aqueous is a transudation, an osmosis, and lacks the intensity even of glandular secretion.

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[*] Gray (Anatomy, 8th ed. page 77,) quotes Kolliker, "the majority of the arteries of the brain and spinal cord, and those of the choroids are unprovided with vaso-motors."

[†] The dependence of intra-ocular tension upon the extra-ocular arterial tension is shown by some late "Observations on the Retinal Blood-stream." (C. H. Usher, Oph. Rev. Dec. 1896.)

NOTE—"According to Klein and Svetlein the retinal vessels are not influenced by division or stimulation of the sympathetic." (Physiology, Landois and Sterling, 2d ed., page 625.) "Since the nervous supply of the choroid is especially distributed to the muscular tissue of the blood vessels the component *may be regarded* (?) as vaso-motor in character." (System of Dis. of the Eye, vol. 1, page 261, Norris & Oliver.)

The term *secretion* offers no conception of energy.

Such an objection would seem to be fatal to the theory, though it is not claimed that secretion is not increased or retained in glaucoma; only that by this means a higher degree of intra-ocular tension *cannot* be produced than is to be found in serous iritis. It is a mere question of physics. That glaucoma has occurred in cases of aphakia, of aniridia, and in others in which the anterior filtration channels were found patulous would prove that impeded excretion had no agency in those instances. In view of such observations, when the anterior filtration channels are found closed in a dissection of an eye after the disease has run its course, we are not justified in assuming that the disease was due to impeded excretion.

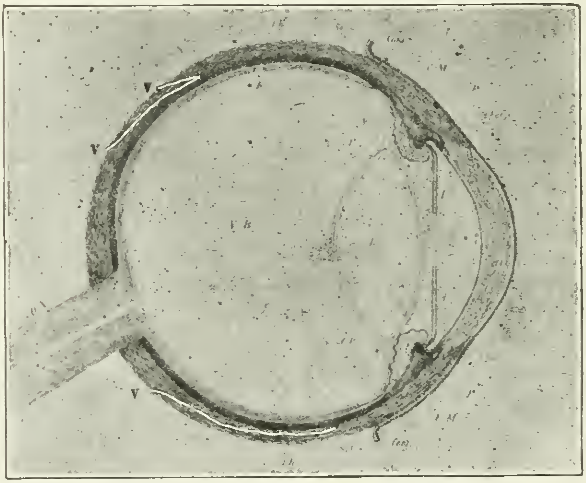
Again, periods of increased intra-ocular tension occur, and pass off without mechanical interference, as in the prodromata. Could this be, if it were caused by closure of the anterior filtration channels?

The character of that obstruction is usually such, that once "the vicious circle" is formed, it can be broken only by foreign aid. Has the volume of the intra-ocular fluids (exclusive of the blood within the vessels) any important bearing upon the high intra-ocular tension of glaucoma?

Advancement of the lens and iris is ordinarily observed in glaucoma, with no apparent pathological changes in the vitreous; if the *volume* of the vitreous did vary, its consistency is such as to preclude the rapidity of variation necessary to account for the modifications of tension in the eye. An increased volume of aqueous humor in the eye cannot produce advancement of the lens and iris (much less of the corpus vitrei), it being *in front* of the lens, and able to distribute itself easily and equally on both sides of the iris, without pressure upon it. If the anterior channels of filtration were obstructed, the impaired outflow in this direction would increase the depth of the anterior chamber, as in serous iritis. When occlusion of the pupil occurs in plastic iritis, and the aqueous humor secreted behind the iris forces it forward in contact with the cornea, we do not promptly have glaucoma as a result. When the anterior filtration channels are closed by the iris, the lens and iris must *have* advanced, or the iris must *have been* dilated, by pressure from behind by a condition *already* present, which causes advancement of the vitreous, lens and iris, and increased intra-ocular tension. Also, when the aqueous is diminished by evacuation through a corneal incision, do not the lens and iris advance promptly to the posterior surface of the cornea? A normal volume of aqueous humor maintains a normal anterior chamber; an increased volume deepens, and a *reduced* volume of aqueous shoals the anterior chamber. Must not such an evacuation take place very slowly to avoid rupture of the distended blood vessels of the fundus by the sudden removal of the support in front to the *vis a tergo* of the general arterial pressure? It is an engorgement of the blood vessels of the fundus depending upon the pressure in the extra-ocular arterial vessels, upon the force of a bounding heart, which, *after iridectomy*, causes intra-ocular hemorrhage in the case of rotten vessel-coats; that, in some instances, prevents the restoration of the anterior chamber; that may end, if the general arterial pressure is sufficiently great and sustained, in malignant glaucoma.

The only rational explanation of a good result from iridectomy in glaucoma is, that a happy moment is chosen when the first force of the storm is spent, and the operation, by easing the pressure upon the intra-bulbar tissues and vessels, permits the static venous blood to move, and *active* circulation to be restored. This moment may be designedly secured, by first relieving general arterial tension and quieting the action of the heart by a heart sedative; better, by HOT baths. To operate under other circumstances may mean an untoward result, and probably accounts for the difference in result of the same operation in similar cases. These comments necessarily apply to any operation which favors an advancement of the vitreous, lens, and iris.

Reasoning, directly and by exclusion, from frequently ascertained and unquestioned facts, constrains to the conclusion that a condition always found in acute glaucoma, which will account for all its features without distortion. offers the true explanation of this form of disease, viz:



Arterial section of the eyeball from before backwards, enlarged five times. The white lines show the length of the channels of the vena vorticosæ ($1\frac{1}{2}$, $3\frac{1}{4}$, and $5\frac{1}{2}$ mm.) relative to the thickness of the sclerotica, which is not usually appreciated. The channels do not extend directly back, but backward and downward. The proper anatomical entrance and exit of the longest channel cannot be shown in the profile.

A great engorgement of the intra-ocular blood vessels, overfilling the space within the sclerotic, most so posteriorly, about the entrance of the arteria centralis, the twelve to twenty short ciliary arteries, and the two long ciliary arteries which pierce the sclerotic at a right angle; elongating the corpus vitrei in the direction of the length of the vessels by lateral pressure, which is magnified by the acute venous stasis developed by any slight increase of intra-ocular pres-

sure upon the vena vorticosæ as they pass very obliquely * *out through the sclerotic; and advancing the corpus vitrei, lens, and iris, by pressure from behind, reducing the depth of the anterior chamber, and applying the iris to the cornea; thus obstructing the anterior channels of filtration, after increased intra-ocular tension has been produced.*

The *direct* course of the arteries through the sclerotic permits ready access of arterial blood, any increase of which, beyond what is normal within the eye, *must* exert some pressure upon, and stretching of the sclerotic, which in turn narrows the lumen of the veins passing *obliquely* through it, still further increasing the intra-ocular pressure until stasis is absolute. Here we have "a vicious circle," but in a region different from that in which it has heretofore been located, and one capable of relief by the control of the primary extra-ocular influence, and without operation; which we so often see to be the case in the earlier attacks, called prodromata.

The engorgement of the vessels of the fundus oculi, existing in acute glaucoma always in direct ratio to the violence of the attack, conclusively shows it to be distinctly vascular in origin, which is extra-ocular. By reason of the high general arterial tension, and the quickened, forcible action of the heart, the blood entering the eye, posteriorly most directly and in most volume, makes room for itself within the sclerotic by driving forward the solid moveable contents of the globe. A state of the system which leads to a reduction in the caliber of the peripheral arterial vessels, demanding an increased effort on the part of the heart, will account for this; because, as the contraction of the peripheral vessels diminishes the size of the blood current passing through them, the propulsive efforts of the heart must increase, and these determine the volume of blood in the direction of *least* resistance. Therefore, the vessels which receive it are the intra-cranial vessels which have no vaso-motor constrictors, and those of the internal organs whose temperature is higher than the body-surface. Obviously. the cause must be some element in the blood which narrows the caliber of the vessels by irritation, aided at times by the contracting influence of low surface temperature, or by some emotion exciting a reflex from the base of the brain, or creating tumult of the heart.

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*"Making channels from $1\frac{1}{2}$ to $5\frac{1}{2}$ mm. in length" (Metz, Anatomy and Histology of the Eye, 1868, page 35.

Whether the intra-ocular vascular engorgement is ever excited by the precipitation of sodium bi-urate within the eye, or not, will probably be settled only by accidental observation. I think, not necessarily. It is more than probable that great emotion disturbing the regularity and stability of the heart's action, or a fit of indigestion with distension of the stomach and consequent reduction of the peri-cardiac space, when the heart is already laboring to overcome the resistance offered by the narrowed peripheral vessels to the passage of a normal blood-current, is the first step in acute action.

In which event, the first indication is to relieve the heart of excessive work by dilating the peripheral vessels, which at the same time will divert the pressure of the blood column from the intra-cranial vessels, from the intra-ocular vessels, and thus reduce intra-ocular tension.

Chronic Simple Glaucoma differs so much from the other forms of the disease, and especially from acute inflammatory glaucoma, that some observers have doubted if it be glaucoma at all. It is glaucoma, a chronic interstital ophthalmitis; a most perfect presentment of a chronic process which can be imagined, and is brought about by the same initial influences which cause the acute form, acting without explosive force. As acute glaucoma is vascular and violent, this form is interstitial and slowly progressive. For years, its development is preceded by a stationary, or an imperceptibly increasing, general arterial tension, united with palpitating and uncertain action of the heart, aud increasing rigidity of the sclerotic coat, leading to the deduction that senility is an etiological facfactor. Age is a predisposing influence, as it is physiologically a period of substitutive fibrosis; if it were an active agent, we would find an increasing percentage of simple glaucoma with advancing age. A new connective tissue growth has, by anatomical dissections and microscopical examinations, been found in all the structures of the glaucomatous globe, and as a formative predominance of special tissue arises in specialized irritability of such tissue, for its cause we must look to some irritant exciting vascular and neurotic disturbances affecting nutrition. The presence of such an irritant, inherited or acquired, constitutes a *diathesis*. The preponderance of evidence, (ocular tissue changes and symptoms, and the associated constitutional manifestations) indicate glaucoma to belong to acquired tertiary syphilis (rarely); or to the diathesis termed *arthritic*, which includes gout and rheumatism.

These are congeners in their origin (inadequate digestion) and in their pathological expression — the modification and proliferation of fibrous tissue, and the irritation of serous membranes.

Gout and Rheumatism.

The two important factors in the arthritic diathesis, generated in the system and constant, are organic acids; uric acid, a product of inefficient proteid metabolism; in excess ("largely a renal question" (Ewart,)) the cause of gout; and latic acid, a fermentation product of the hydro-carbons (sugar); in excess (due to the condition of the integument), the cause of rheumatism. No uric acid has ever been found in the blood in rheumatism, and its excretion by the urine in this disease does not exceed the quantity usual in fevers Haig believes both affections to be due to uric acid, to which Garrod and others demur. In acute attacks of both diseases there is chill, fever, and sweat, pain in the joints, a coated tongue, loss of appetite, thirst, constipated bowels, and scanty, high-colored urine which makes a red deposit on cooling (most of which is a familiar picture in acute inflammatory glaucoma.) In rheumatism the fever is more marked, the sweat more profuse, and acid (containing lactic acid,) metastasis more common, and the joints seized in the first attack are larger for even the peri and endo-cardium, the pleura, the peritoneum, the spinal or cerebral meninges may be involved; for lactic acid is excreted by the urine under no conditions, beyond an approximately fixed quantity, is not precipitated, no deposit ever having been found; nor is it known to combine tenaciously with any constituent of the blood. When in excess, therefore, *unless excreted by the skin*, it is retained in the circulation and acts as an excitant; an *excitant*, for Gaskel found that when dilute lactic acid was injected into the circulation of a frog the caliber of the arterial vessels was enlarged and the ventricle of the heart was relaxed. The action of dilute alkaline solutions upon the heart and the arterial coats was the reverse; contraction.

Lactic acid, denied passage through the skin by the constringing effect of cold and damp upon the dermal vessels, passes with the blood in greater volume to the deeper-seated organs of higher temperature, and excites violent action there. The larger the joint and the higher its temperature, the larger the volume of blood, consequently the greater the quantity of lactic acid which *will pass through it*, and the greater the stimulation. The lower temperature of the small joints, and the smaller volume and slower current of blood circulating through them, limits their exposure to the effect of lactic acid. The great excess of lactic acid in the blood in this disease, its saturation of the saliva, the sour (lactic acid) sweats, the purely conjectural attitude of the bacterial and the neurotic theories, and the suggestive habits and environment of rheumatics, continue to the lactic acid theory the prominence and probability which have been attached to it for some years.

These are not diminished even by the failure of its treatment by alkalies, for, according to Sir W. Roberts, it is difficult to influence the reaction of the blood, requiring large quantities of acids or alkalies, and then the result is uncertain and temporary, owing to their prompt elimination by the urine. Moreover, "lactic acid is *formed* whenever sugar in solution is brought in contact with an alkaline, or earthy, carbonates in the presence of a special ferment, as casein." (U. S. Dispensatory, 1894, page 66.) An excessive formation of lactic acid probably arises from the inefficient preparation in the mouth of hydro-carbons, due to insufficient salivation, a subnormal percentage of ptyalin in the saliva, or the unfavorable conditions to which they are subjected (hot and cold drinks with food); for ptyalin acts only between 95° and 102° F. A low ratio of ptyalin, which the analysis of the saliva of some rheumatics has shown, taken with an inherited delicacy of the skin, may account for an inherited tendency to rheumatism.

The claim in favor of dampness and cold as initial causes, because rheumatism is more common in New England than elsewhere in the United States, and in Scotland and Ireland, than elsewhere in Great Britain, happens to be coincident with the fact that in those sections the hydro-carbons, eaten in a manner least favorable to ptyalization, are a staple food.

The writer has dwelt at such length upon this subject, because rheumatism has so often been included with the uric acid diseases, which, to his mind, is clearly an error; because it is a part of the subject assigned to him; and because in consequence of the excess of fibrine (sometimes twice the normal) in the blood in rheumatism, the affections of the eye due to it are apt to be *adhesive* in character. Plastic, or parenchymatous iritis may be due to rheumatism; serous iritis is of gouty origin.

Gout in its *articular* manifestations is a local affection of constitutional origin; abarticular gout, latent or declared, precedes the seizure of a joint, and the term gout should include all the baneful activities of uric acid in whatever part of the body they are met. Although in addition to the very chronic process of fibrosis which is the tissue-form ultimation of malnutrition, and due in part to an excess of urates in the circulation, a common feature of gout is the local deposit of sodium bi-urate, which may be frequently seen in the palpebral and bulbar conjunctiva, in the skin as tophi, as well as in the joints, and as Meyer (Fergus's Transl. Dis. of the Eye, page 248) states, "in acute glaucoma the aqueous is muddy and sometimes forms deposits on the posterior surface of the cornea," which condition I have not observed. It is not easy to determine the character of such deposits, but I have held deposits in this situation following serous iritis under suspicion of being sodium bi-urate, though Garrod claims that the inflammation excited by their presence destroys such deposits; we do not find this true in keratitis punctata. As a deposit within the eye in sufficient quantity to be seen is not essential to its power to create excitement in so delicate a structure; as only irritation sufficient to fix the focus of vascularity when the heart is in exalted action from disturbed emotion, etc., is required to decide an acute glaucoma; a determination of the presence of such a precipitate would be inconclusive. Such investigation is beset by invincible difficulties. The urates, while remaining in the circulation, produce irritation of the fibrous tissues and serous membranes with which they come in contact, and may thus decide a region for the concentration of any general vascular tumult, but they do not directly cause *acute* local trouble unless massed by precipitation, which is favored by the lower temperature of the small joints, their consequent comparatively sluggish circulation, their composition of fibrous and serous tissue for which the *materies morbi* of gout has a predilection, and the injuries to which they are exposed. All of these conditions the globe of the eye satisfies.

The presence of a precipitate in the bulb not being a *sine qua non* to an acute glaucoma, an excess of urates in the blood and palpitating action of the heart being sufficient to declare such an effect, we may accept as evidence of gout the existence of migraine, eczema, uncertainty of temper with insomnia, mental depression or hebetude, crackling of the cervical spine, pain in the gastrocnemia after a short walk; certain forms of scleritis, keratitis, and conjunctivitis, serous iritis, pulsating arteries and veins, increase of albumen in the aqueous, extravasations of venous blood, turgid and swollen ciliary processes, and great œdema; pharyngitis, cystitis, so-called idiopathic urethritis, herpes, or progressive deafness. The longitudinal ridges and broad lateral furrows, and the extreme brittleness of the finger nails, are additional indications of the degenerating influence of the diathesis. The thread-test of the blood for uric acid, however, is crucial.

Gout expressing itself in glaucoma has not necessarily other serious manifestations. I have never seen a glaucomatous person with a bald head.

The malaise and slight chilliness, followed by flushing of the face and mental stupor, so often observed in uric-acid-ædmia, is not rarely mistaken for some form of malarial fever, as it may have periods of remission and recurrence within the twenty-four hours, to which error the beneficial effect of quinine, excluding the urates from the circulation, is contributary. An examination of the blood for the malarial parasite, or uric acid, may be essential to a diagnosis.

That no deposits of sodium bi-urate have been externally manifest does not justify the exclusion of gout as a cause of glaucoma, for gouty changes sufficient to destroy life itself have occurred without apparent joint deposits or active inflammatory processes.

The known incidents of acute podagra and acute glaucoma, and their perfect mimicry, allowing for the function of the organs attacked, show each to be an "uric acid storm," the region being selected by reason of its individual specialized irritability, a tendency ordinarily inherited.

Sir William Roberts (Croonian Lectures, 1892, Uric Acid, Gravel, and Gout, pp. 33 and 119,) offers a very fascinating suggestion in explanation of habitual excess of uric acid in a system.

"Structurally, no essential difference exists between the kidneys of birds and snakes, and those of the highest order of mammals—man. Functionally, there has been immense evolution from the solid or semi-solid form to the watery form of urine, and in the substitution of a soluble form of nitrogen (urea) for one very sparingly soluble (uric acid). This particular of physiological evolution has not yet been perfected, and man must still excrete 8 or 10 grains of uric acid a day.

"In the course of such an evolution a double change would be in progress, namely: A gradual substitution of urea for uric acid as the final term of proteid metabolism; and the complementary modification in the functional aptitudes of the renal cells—that is to say, an ever-increasing aptitude for the excretion of urea, and an ever-diminishing aptitude for the excretion of uric acid. When, after long æons, the mammalian type was at length evolved, there remained only a small residuum of uric acid to be dealt with, and, correspondingly, only a small residuum of the original apititude of the renal cells for its excretion. A feature thus begotten would present great variation in different individuals. Generators of gout, and members of gouty families, are, for the most part, people of fine frames and ample appetites, who are withal great consumers of nitrogenized food. In such persons there is an enhanced production of urea which expands by grams, while uric acid expands only by grains. There would thus arise a persistent demand on the urea excreting faculty which could only be satisfied by an encroachment on the residuary faculty for the excretion of uric acid."

When he produces urea and no uric acid from nitrogenous food; and when from this he has assurance that "he eats to live," and not to die, man will probably have reached his physical millenium, and have no glaucoma.

KELOID OF THE CORNEA.*

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CHICAGO.

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In February, 1895, Baby Oleson, aged 2 years, was brought to me because of a disfiguring prominence of the corneal portion of the left eye. The parents, who were intelligent Scandinavians, gave the following history:

When the child was three or four days old the left eye became red and swollen, and discharged yellow matter. A midwife who was in attendance said it was a cold; the usual application of breast milk was made and Dr. Heyn, an ophthalmologist, who has now left the city, was consulted only after the cornea had become opaque. The eye was inflamed and under treatment for a month or more, and then the father and mother saw the white scar and knew that the eye was blind. For six months, the mother said, it did not change; then the front of the eyeball began to grow, and continued to do so for about six months, and then ceased. The eye had never seemed painful, but for some time had been irritated a little, and seemed to worry the child. It had been noticed by the parents that the lids were never closed over the projecting eyeball.

I supposed that I had to deal with a case of total staphyloma, with thickening and epidermization of the cornea, and advised an abscision; but when I had an opportunity to examine the eye more thoroughly under an anæsthetic, discovered at once that it was a solid tumor. When the abscision and evisceration was completed, and I could examine the specimen, I found that the cornea had been perforated, that the iris was adherent throughout its entire extent and that the cornea was uniformly thickened, measuring in the center nearly, if not quite, 8 mm. in thickness. The external surface was rough and the color that of the integument. The specimen was immediately placed in Fleming's solution. The operation wound healed kindly, and when I last saw the patient, several months after the operation, the cicatrix was normal and the stump freely movable in the orbit. I have recently submitted the hardened cornea to my friend, Dr. Hektoen, professor of morbid anatomy and director of the laboratories at Rush Medical College, for examination, and he submits the following report:

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*Read at a meeting of the Chicago Ophthalmological Society, February 9th, 1897.

"The specimen left for examination December 14th shows the following: It consists of one-half of the greatly thickened cornea, the cut surface being smooth, the margins having attached to them small fragments of the sclera and the structures at the irido-corneal angles; the piece comes to me in alcohol. The anterior surface is rather rough and black in color.

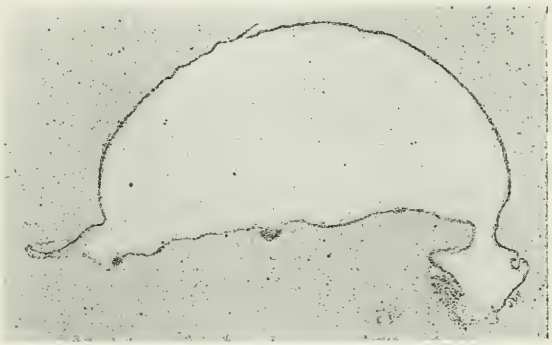

Fig. 1. A section of the Cornea magnified four times.

"After embedding in celloidin, sections from 30 to 50 microns in thickness were cut; thinner sections were not obtainable because of the great desity of the tissue; the sections were stained with hæmatoxylin and eosin, according to Van Gieson's method. Under the microscope it is found that the anterior epithelial covering is somewhat but uniformly thicker than normal, and that the cells composing it are more flattened than usual, while those upon the surface have formed a relatively thick horny layer, so that the cornea is provided with a distinct 'stratum corneum.' In some places the lower layer of cells is of a brownish color, but otherwise the anterior epithelial layer of the cornea is free from pigment, but the conjunctival covering present is the seat of a light brownish diffuse pigmentation.

"The anterior basal membrane (Bowman's membrane) is not conspicuous, its place being taken by fibrillated material. The greatest change is noticed in the substance proper of the cornea. Under low power it is seen to consist of a densely lamellated structure, the lamellæ running parallel to each other, but they are broader and irregular as compared to those of the normal cornea. Running obliquely or transversely across the sections are distinctly fibrilated bundles that often split up into smaller bundles; the angles formed in this manner are always directed toward the anterior surface of the cornea; these bundles of fibrillæ are as numerous in the posterior as in the anterior strata of the cornea; the fibrillæ stain red with Van Gieson's counter-stain (acid-fuchsin—picric acid) and a faint red with eosin. The lamellæ described above behave in the same manner. Between the lamellæ are irregular, narrow spaces that seem to contain nuclei; the inter-lamellar spaces are larger and plainer in the posterior strata of the sections. The substance proper seems to be avascular; in one or two places are found larger, but empty circular spaces, in one of which an indistinct endothelial lining seems to be present.

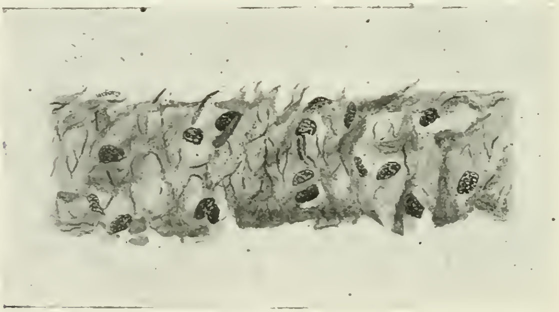

Fig. 2. Shows Oval Nuclei imbedded in a network of partly fibrilated, but principally homogeneous lamellæ, running in various directions. Fixed in Fleming's solution, celloidin embedding, hæmatoxylin and eosin staining x 250.

"In order to obtain a better idea of the substance proper of the cornea a thick section was taken, the celloidin dissolved out, and then it was cut into small pieces, some of which were reimbedded in parafin; in this way sections 10 microns thick were cut and stained as before. In these sections it can be recognized that the lamellæ are composed of fine and coarser fibrillæ that interlace rather irregularly, and the inter-fibrillar and inter-lamellar spaces contain connective tissue cells with large flattened nuclei (corneal corpuscles). Their number is not increased. The posterior basal membrane is absent over one-half of the posterior surface of the cornea, its place being taken by lamellated material; the posterior endothelial layer is absent completely, and its place is taken by an irregular layer of yellowish and brownish pigment granules and masses of varying thickness; whether the brownish pigment is all enclosed in cells or not could not be determined; in places the pigment masses were absent, and corresponding to these places it is usual to find pigment heaps upon the substance proper; at one irido-corneal angle this pigment layer is continuous over a rounded projection (iris) withthe pigment layer of the ciliary body.

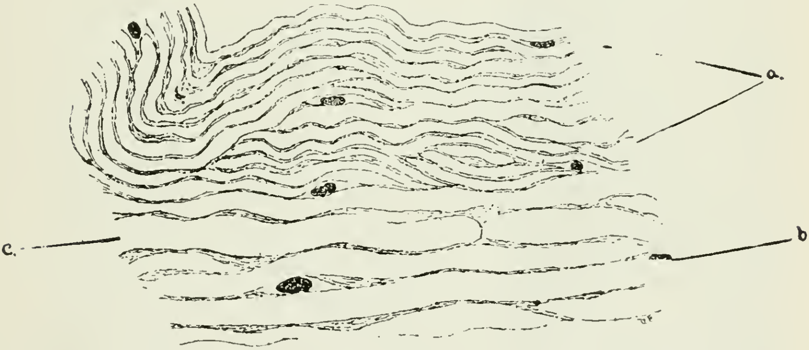

Fig. 3. Diagramatic drawing of a portion in which the lamellæ and fibrillæ pursue a parallel course; *a* narrower, *c* broader lamellæ, *b* nuclei x 350

"The diagnosis would be hyperplasia of the substance proper of the cornea (keloid), with epitheliosis of the anterior surface and a pigment layer upon the posterior surface, due to prolapse of the iris. "L. HEKTOEN."

None of the text-books which I have in my library makes mention of keloid or hyperplasia of the cornea, but Fuchs says (American edition, p. 195):

"Cicatrices of the cornea are often subjected to subsequent metamorphoses. Thus it may happen that cicatrices originally flat later become ectatic. Markedly ectatic cicatrices, the most prominent point of which is but incompletely covered by the lids, not infrequently display at this point a xerotic condition of the epithelium, which looks dry and epidermoid. In old, dense cicatrices yellow spots sometimes develop, caused by deposition of fat or concretions or colloid matter.''

R. Simon reports, in the *Centralblatt f. praktische Augenheilkunde*. 1882, p. 193, the case of a stonemason who came to the Royal University Clinic on December 15, 1886, having had, twelve days before, a lime mixture spurted into his right eye. Schweigger found the cornea ulcerated and infiltrated, and in spite of repeated cauterization and division of the ulcer according to Saemisch's method, it advanced to purulent destruction of nearly the entire cornea, and when the patient was discharged, February 1st, only a small marginal zone of the cornea remained clear.

On April 23d, 1890, the patient presented at Hirschberg's clinic. asking the removal of the eye. The cornea was then the seat of a solid, white tumor, pointing somewhat to the nasal side, its base reaching nearly to the limbus, the upper half being covered with a smooth vascular network. The eye was removed and hardened in Müller's fluid and alcohol. The globe was normal in size and structure, except the cornea; section showed that the tumor involved almost the entire breadth of the cornea, reaching the limbus on the temporal side, but leaving a free strip of cornea about 2 mm. wide on the nasal side. Its greatest thickness, including the remaining corneal tissue, was $3\frac{1}{2}$ mm.

Microscopical examination showed the sclera and conjunctiva normal. except that in the latter the vessels were enlarged. On the nasal side a strip of cornea existed, which was normal with the exception of slight vascularity and collections of round cells about the vessels. The epithelial layers were continuous over the tumor, but somewhat proliferated: in some places slightly, in others very much, and at certain points dipping down into the tissue of the tumor. At some of these points as many as 30 epithelial cells, overlying each other could be counted. Posterially the tumor rested upon a longitudinal stratum of partly normal and partly altered corneal tissue, and in the lower part consisted chiefly of a very fibrous connective tissue, the course of the fibers generally being parallel with the corneal tissue. In the anterior part of the tumor three divisions could be made out. The middle portion showed bundles of connective tissue fibers crossing irregularly. On the temporal side was a narrow but dense bundle arching up under the epithelium and back to the posterior, horizontal fibers, forming a capsule enclosing a clear spot. On the nasal side a broad bundle of fibers also crossed under the epithelium, but soon lost itself, and there was no definite margin to the clear spot on that side.

Scattered all through the tumor were many spindle-shaped connective tissue cells and round cells, which in some places, especially near vessels, were collected in groups. Among the bundles of connective tissue fibers were numerous cavities, usually of moderate size, which contained an almost perfectly transparent substance. The nasal side of the tumor showed a different structure. The connective tissue fibers had largely disappeared, their places being taken by numerous round, spindle-shaped and stellate cells. The whole posterior surface of the tumor was bounded by corneal tissue, almost normal toward the sides, but with increase of corneal corpuscles and some round cells, and anterially toward the tumor numerous vessels.

Simon remarks that such a tumor is extremely rare, is purely a corneal growth and consists of hyperplasia of the cicatrix, and must be regarded as a fibroma with partial myxomatous degeneration. Nagel, in abstracting this report for his *Jahrbuch*, says that it can only be considered as a case of cicatricial keloid, and this is the only reference to the possibility of keloid of the cornea which I have been able to find in the literature.

I. Szokalski, Warsaw, reports in the *Annales d' Oculistique*, Brouxells, 1895, p, 209, the case of a woman, aged 40, strong and well, who had had a total staphyloma of the cornea from youth, and wished it removed, that she might wear an artificial eye. She said that the eye became inflamed from time to time, and was then very painful. The eye was removed. He speaks of the case as one of hyperplasia of the cornea, and describes a tumor of grayish brown color, resembling a staphyloma in form, rising abruptly from the edge of the sclerotic and having a regularly rounded surface. The thickened cornea was 4 or 5 mm. thick, and almost cartilaginous in appearance. Microscopically it consisted first, of a thick epidermic layer; second, a layer of cellular tissue containing capillaries (Bowman's lamina being absent in the center but normal at the edges); third, the corneal tissue proper, showing its fibrillary nature, but full of granular masses, which in places formed nests of fatty substance; this composed three-fourths of the thickness of the growth. The membrane of Descemet was visible in places, but on its posterior surface the normal epithelium was replaced by nodosites of transparent granulations.

These two cases are all that I have been able to find, in a rather extended search of the literature, at all resembling the case which I have reported. Perhaps the term keloid, as applied to this case, is to be criticised. For histological reasons it would, perhaps, be better to call it a case of chronic inflammatory hyperplasia; but in its genesis it certainly resembles keloid. A dense scar formed in the cornea, as a result of keratitis and a perforating ulcer. From the description which the parents gave I should judge that the entire cornea was opaque from this cicatricial tissue. Several months after the inflammation had subsided the scar began to grow, with the result described. I have had little opportunity to study keloid of the skin, but it seems to me that we have here a similar pathological process. Whatever the pathology, the rarity of the condition makes the case worthy of record, and I am glad to be able to submit it for your discussion.

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ON INTERSTITIAL KERATITIS AND ITS COMPLICATIONS.

By C. Devereux Marshall, F. R. C. S.,

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With Four Micro-Photographs.

There are some diseases of the eye which, although their clinical aspects are very well known, yet their histological appearances are comparatively seldom seen. This, of course, arises from the difficulty there is in obtaining specimens for microscopical examination.

To this class belongs the important group of cases which come under the head of interstitial, or parenchymatous keratitis.

Although this disease sometimes runs a most severe course, and may produce profound effects upon the eye as the visual organ, yet one may have years and years of experience without ever having the opportunity of subjecting a specimen to a more thorough examination than that afforded by the use of a couple of lenses or the mirror of the ophthalmoscope.

I consider myself very fortunate in having been able to obtain some specimens of eyes which have suffered from accidents, or diseases which have necessitated their removal during certain stages of this malady, and I hope that a description of such will not be found uninteresting.

In the first place, it is necessary to define exactly what one means by the term "interstitial keratitis," as of course any inflammatory affection of the cornea will give rise to an interstitial keratitis, such for instance as an ulcer or suppuration, and frequently a similar condition is seen as a result of trachoma.

Such cases as these are not included, and I shall confine myself entirely to a description of the disease as it appears in persons who are the subjects of inherited syphilis, although a similar condition is sometimes, though rarely, seen as a tertiary manifestation of acquired syphilis. This latter condition, however, I have never had an opportunity of examining other than clinically, but I believe the two diseases to be very closely related to each other.

When discussing a subject like this it is absolutely essential to keep before one's mind the main embryological facts which concern the cornea and adjoining structures, and for the purpose of rendering these clear I will very briefly recount them.

The corneal epithelium is formed from the external epiblast which, first of all, rests against that which is destined to form the lens.

The substantia propria has quite a different origin. It is derived from a layer of mesoblast, which can be seen at a very early stage of the development of the eye, lying between the epiblast, which forms the rudimentary lens, and that which is to form the corneal epithelium. Then a cleft appears in this. The anterior part remains adherent to the cuticular epiblast and forms the substantia propria of the cornea, while the posterior part forms the lens capsule and the pupillary membrane. This cleft afterward opens up and forms the anterior chamber.

The epithelium on the posterior elastic lamina, or Descemet's membrane, is derived from mesoblastic cells which grow from the periphery and gradually form a covering by spreading themselves out over it.

The choroid and iris are likewise developed from the mesoblast in contact with the outer layer of the optic cup, and the sclerotic is entirely derived from the mesoblast. We thus have the substantia propria of the cornea, the iris, the choroid and the sclerotic, all closely related embryologically, and all derived from the middle layer of the blastoderm, while the corneal epithelium, the lens and the retina are epiblastic structures.

It is usual, clincally, to recognize at least three stages of the disease. First, there is the stage of infiltration, wherein the cornea becomes cloudy and more and more infiltrated with small round cells, as the disease progresses, until it gets almost as opaque as ground glass.

This gradually passes into the second stage, during which vessels develop and the whole cornea becomes vascular. Then, after several months, the third stage of resolution begins and goes on until, in favorable cases, the cornea regains a great deal of its original brightness, and in slight cases, it may become almost as clear as it was at first.

If the opportunity occurs of seeing such cases in a very early stage, and almost as soon as the patient becomes aware that anything is the matter with the eye, one is usually able to recognize some slight muddiness of the aqueous, and, on careful examination, the condition of so-called keratitis punctata may be seen with a somewhat deepened anterior chamber. Such an eye presents the characteristic appearance of serous iritis.

It occasionally happens that one can make an ophthalmoscopic examination before the cornea becomes too cloudy, and then similar changes may be seen going on in the choroid, and some patches of œdema and early inflammatory changes are recognizable. In addition, the ciliary vessels become injected, and thus we have in such a case an inflammation of the whole uveal tract and the parts which are of mesoblastic origin. It is not common to see all these changes in the same eye, but still they do occur to a greater or less extent, although, as a rule, one structure is more affected than the other, but the affection is practically never entirely confined to one part only. We will endeavor, by means of the specimens available, to illustrate these changes as far as possible.

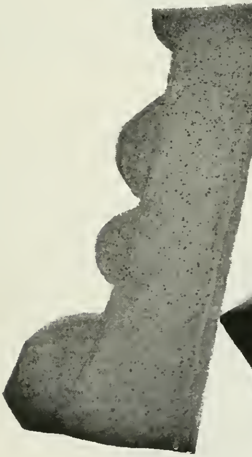

Fig. 1.

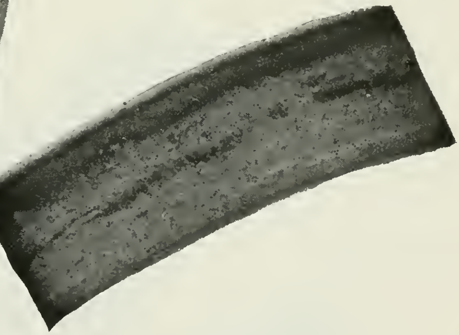

Fig. 2.

Fig. 1 represents the first condition of keratitis punctata. This is seen to a greater or less extent in all cases of serous iritis. In this section it is obvious that the cornea itself has not yet become involved. The small round cells which go to form the dots are derived from exudation taking place from the ciliary body and iris.

The extent to which diapedesis takes place entirely depends upon the severity of the inflammation, but under the conditions about which we are here speaking it never goes on to a very great extent; however, as we shall see later on, it may be sufficient to cause obstruction to the outlet of fluids at the angle of the anterior chamber. Occasionally some dots are situated in the deepest layers of the cornea, but the dots on Descemet's membrane are the first to appear.

The second stage of infiltration is well shown in Fig. 2, which was from a young person whose eye had been affected with the disease for not more than between five and six weeks. Here we see the stage of infiltration well marked. The dots on the back of the cornea have disappeared, and there is only a small irregular-shaped deposit seen adherent to the cells lining Descemet's membrane in certain parts of the section. In the central part of the cornea, from which the photograph is taken, no vessels have as yet become developed though, at the peripheral parts, they are making their appearance, and there is great injection of tho episcleral arteries and veins.

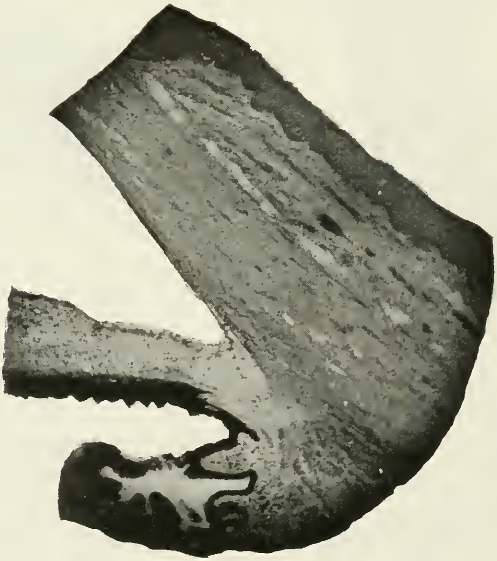

Fig. 3.

The ciliary body is showing very marked changes. Its vessels are somewhat large and injected, and there is considerable infiltration of its substance.

The iris is, of course, directly continuous with this, and here we notice that the base is most affected. It is slightly thickened, and there was some slight exudation filling up the spaces of Fontana. It is easy to see how that, if the exudation remained and became organized, there would be a great tendency for adhesion to form and thus to very considerably narrow the angle of the anterior chamber.

Following closely on this is the third stage in which vascularization takes places. Figure 4 shows this well. The epithelium covers the anterior surface, but the whole of the interstitial substance of the cornea is very much altered, and we see the vessels here well developed and full of blood, together with extensive round cell infiltration. The separate bundles of fibrous tissue which compose it are unrecognizable in the part most affected, and even where they can be just made out they have undergone so much change that they are separated, and exudation lies in the small spaces thus produced. The vessels are seen to be much more developed in the anterior part of the cornea than in the posterior, as is sometimes described.

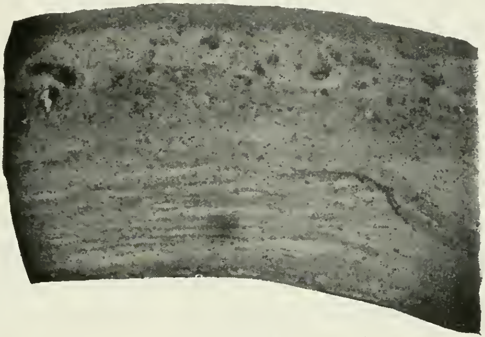

Fig. 4.

The next stage is that of resolution, and the degree to which this goes on varies much in different eyes. Some of the slighter cases become so improved and clear to such an extent that it is difficult without very careful examination to see that there has ever been anything the matter with the eye.

On the other hand, the opacities may remain permanent and never clear up at all. Still worse than this, the cornea and ciliary region may be so much affected that their structure is permanently weakened, and instead of forming a sufficient support they bulge under the intra-ocular tension and become more or less staphylomatous.

Again, another misfortune may attend an eye in this condition, and that is, the iritis may lead not only to the formation of posterior synechiæ, but also to the closure of the angle of the anterior chamber by adhesion of the periphery of the iris to the back of the cornea, and so a condition of glaucoma is produced. Thus the sight may not only be greatly impaired by the changes in the cornea, but also the retina and optic nerve may be renderd quite incapable of performing their normal functions.

There is still a further change to which such eyes are liable, and that is an affection of the posterior part of the uveal tract, viz., the choroid.

Now, nothing is more common than to observe patches of choroiditis in eyes which have suffered from interstitial keratitis, and the reason for this is obvious, and is just what one would expect. If the disease be regarded as an irido-cyclitis it is, *a priori*, just as likely that the inflammatory changes will extend backward as well as forward. Often when it goes backward the choroidal changes are infinitely greater than the corneal, and conversely, when it travels forward the cornea may be far more affected than the choroid.

We thus see that that the affection known as "interstitial keratitis" is really a certain manifestation of a disease which affects the whole uveal tract to a greater or less degree, and that this is the tertiary manifestation of syphilis, usually congenital,but sometimes acquired; and whereas the anterior part of the eye,the cornea, is the most commonly affected in the former, so is the posterior part—the choroid—most affected in the latter, and between these two extremes every stage is seen. What exactly is the determining point as to which part of the uveal tract will suffer most in any individual case I am quite unable to say.

A great deal of confusion has been caused by observers paying attention only to the clinical aspect of the cases, and thus many names have been given to what is essentially one disease. Even the name "interstitial keratitis" is a bad one, as it only describes one phase of the affection. And among other terms which have been used we find Vossius describing a disease called by him "Keratitis Centralis Annularis," and this indicates the condition sometimes seen when small opacities commence near the central portion of the cornea and then they coalesce and form a ring, the center of which may or may not become opaque.

Keratitis punctata syphilitica has been described by Mauthner and others, and simply represents the deposits seen sometimes in the cornea of syphilitic subjects. It not at all infrequently happens that the opacity assumes a triangular or rounded shape, and this is often situated at the lower part of the cornea; or again, localized opacities may extend more or less completely around the periphery of the cornea, and in such cases there is often very marked iritis or cyclitis, or both.

A description of this variety was given by Brailey in the transactions of the Ophthalmological Society of Great Britain, Vol. XV.

He endeavored to show by means of a series of cases that there is a peculiar form of iritis seen in the late tertiary stage of acquired syphilis, and also of a very late manifestation of congenital syphilis which had not hitherto been described.

All his cases showed very well marked iritis and cyclitis, with more or less corneal affection. This latter was first recognized by deposits forming the so-called keratitis punctata on the back of the cornea; as time went on the opacities developed until at last a dense bluish-white triangular plaque formed deep in or behind the lower part of the cornea. In such cases small gummata sometimes developed at the edge, and thus several peripheral anterior synechiæ were formed.

Such cases as these must have come under the observation of most ophthalmic surgeons, and at least they are by no means rare at Moorfields, but I fail to see any pathological or clinical reason for regarding them as belonging to a separate class from the ordinary cases clinically known as interstitial keratitis. They both commence to a greater or less degree as a serous irido-cyclitis. They both occur in individuals who are subjects of inherited or acquired syphilis, and their somewhat different clinical aspects may readily be due first of all to the iris and ciliary body bearing the greater part of the disease, and, secondly, to the fact that the patients in whom this manifestation is chiefly seen are older and their tissues—*e. g.*, the cornea and sclerotic—are denser and less likely to become inflamed than the young and softer tissues of children. That this latter makes a vast difference to the clinical course of a disease can be readily demonstrated by looking, for instance, at the effect of increased intra-ocular tension in persons of different ages. If it occurs in infancy we have the large staring condition of eye known as buphthalmos produced; whereas, when it occurs in adult life, we have practically no change in the shape or appearance of the eye, and it often happens that the cupping of the optic disc is the only thing that tells us that undue intra-ocular tension has been present. Sometimes a weak spot in the sclerotic bulges and may lead to the formation of an equatorial, or, more rarely, of a ciliary staphyloma, but such eyes are not uniformly enlarged.

From the point of view of treatment it is in the highest degree essential that the true pathological conditions present should be kept in mind, and it is owing to the neglect of this that absolutely inefficient and even erroneous treatment is adopted. We here are dealing with a disease which may lead to blindness in a variety of ways, and, therefore, the particular danger attending any individual case must be recognized and treated.

The conditions which most commonly lead to great deterioration of sight are the following:

(I.) Irido-cyclitis, leading to impaired nutrition of the whole eyeball, blocking of the pupil, weakening of the sclerotic in the ciliary region and the formation of ciliary staphylomata.

(II.) More or less permanent opacity of the cornea.

(III.) The formation of adhesions between the iris and cornea, leading to closure of the angle of the anterior chamber; these may only affect the extreme periphery, or they may be much wider and lead to an extensive attachment of the two structures.

(IV.) The formation of posterior synechiæ, leading to blocking of the pupil and obliteration of the communication between the anterior and posterior chambers.

(V.) As a result of condition III. and IV. a secondary glaucoma will be produced with all its attendant perils and complications. This is the usual cause of the large staphylomatous eyes which are sometimes seen to follow a severe attack of the disease in childhood.

(VII.) Shrinking of the globe with detachment of retina and usually more or less pain, and finally complete disorganization of the eye.

(VII.) Choroiditis, with secondary involvement of the retina.

Considering that the disease is of syphilitic origin, there can be no question about the advisability of treating the patient on anti-syphilitic lines. But, although it is a tertiary manifestion, yet experience shows that mercury is of the greatest possible benefit, and does far more good when given in the form of baths. But this is not the point upon which I want to dwell, rather do I wish to indicate the local treatment of the various pathological processes which are met with.

As I have already attempted to show, the disease in its simplest form is essentially an irido-cyclitis, and the symptoms first met with are those of serous iritis. There is the somewhat deepened anterior chamber, the slight turbidity of the aqueous and the so-called keratitis punctata.

In this condition the first thing to do is to use atropine, and get the pupil well dilated, and then of course the risk of getting posterior synechiæ is greatly diminished. The usual auxiliary treatment, that is, hot bathing several times a day and a shade for the eyes, are of course ordered. The treatment of this condition is simple enough, but shortly afterward the stage of infiltration develops and may go on until the cornea resembles ground glass rather than clear, and this gradually passes into the vascular stage.

Unfortunately but little can be done to prevent this infiltration going on, though mercury properly administered is of great service, but local remedies do not have much effect upon it. Atropine is the one thing essential, and without this serious trouble may occur as the result of blocking of the pupil. Some people have recommended eserine from its supposed beneficial action on the cornea. When one considers the nature of the disease it is at once apparent that the use of such a drug here is diametrically opposed to all reason. Even if the intra-ocular tension be much increased, it should not be used, for this symptom is due to the iritis and to the aqueous containing inflammatory products which may close the spaces of Fontana, and in practically all cases the anterior chamber is deeper, or certainly not more shallow than normal, therefore theoretically it can do no good, while practically it does harm.

If the tension gets to be really serious something must be done for its relief, though in many cases when the increase is slight atropine frequently lowers it, and as it has the proper action of the pupil it should be continued in the hope that it may check the iritis, and thus cure the cause instead of the symptoms only. It sometimes happens that the tension becomes too high for this to be efficient, and then we must have recourse to one of the three operative measures for its relief, viz., paracentesis, sclerotomy, or iridectomy.

It is difficult to imagine that iridectomy could be of much service. We already have an iritis due to a toxic cause as the bottom of the trouble, and if we further irritate the iris by cutting it we are likely to make matters worse instead of better. The tension in this case is, as a rule, not due to the close approximation of the iris to the cornea, but to the plastic nature of the fluid occupying the spaces of Fontana, as has already been pointed out.

This, therefore, is a temporary rather than a permanent condition, and we simply have to steer the eye safely through this danger until the time comes when it no longer exists.

Paracentesis is, in the majority of cases, quite efficient. We here lower the tension for a time, we tap the aqueous chamber and get rid of a quantity of fluid, which is more or less rich in albuminous material; we allow the eye to secrete fresh and probably healthier fluid; the iris is not in any way interfered with, and the operation is of so so simple a nature, and causes so little disturbance, that it can be repeated at intervals should it be found necessary to do so. It is far less severe than a sclerotomy, and should always be tried first.

Next, with regard to the vascularity, can this be successfully treated, and, if so, how?

The line of treatment is likely to be much modified by the way in which we regard the presence of the blood vessels. That is to say, are they, like the infiltration, part of the disease which we are endeavoring to stop, or are they really due to a reparative process which has for its object the clearing away of inflammatory deposit already there?

Opinions may differ, but it seems to me that even if they are a manifestation of the disease to start with. yet it is impossible for the cornea to clear without them, and although the numerous vessels developed in a clear structure like the cornea are by no means unmixed blessings, *per se*, yet anything which will aid its nutrition or help to clear away the deposit already existing between and in its bundles of fibers must be regarded in a favorable light. In order to get rid of the vessels periotomy has been done here, as well as in the pannus due to trachoma, but when the ultimate function of these vessels is recognized, as well as their deep origin and situation, it is obvious that such an operation cannot materially aid the eye in resisting the disease—rather the reverse is true, and it probably puts the cornea in a considerably worse position than it was before. One might as well ligature the main vessels leading to an inflamed area while the condition which was causing the trouble remained active.

It should never be forgotten during the stage of inflammation that there is always a tendency, more or less marked, to the formation of adhesion between the iris and any part with which it may be in contact. Atropine must, therefore, be continued whenever possible, as with a dilated pupil posterior synechiæ are avoided. There is another less common, but by no means less urgent danger, and that is the formation of anterior synechiæ.

One way in which this is liable to develop is by tapping the anterior chamber. The aqueous is let out and the iris comes to lie against the back of the cornea. If the fluid continues to drain away, one may find that when the wound is closed the two structures are firmly adherent. This, of course, is one of the most disastrous things that can happen, as we then have the angle of the anterior chamber permanently closed, and the eye will rapidly drift on to a condition of absolute glaucoma. The only hope in such a case would be the production of that very undesirable condition, viz., a leaking cystoid scar. The danger of adhesions forming is far less if a simple paracentesis is done than if the more serious operation of sclerotomy be performed.

There is still the final stage of resolution. The ultimate vision is entirely dependent upon the degree to which this goes on, therefore we must aid it in every possible manner.

As has been shown above, the vessels diminish as time goes on and the cornea becomes more and more clear, but still some permanent opacities nearly always remain, except perhaps in the mildest cases, and even then it practically never clears to such an extent that it is impossible to recognize some change on a careful examination. This is really only what could be expected, for one cannot imagine that so delicate a structure as the cornea could be as clear after an attack of inflammation as before it.

If only the stage of slight infiltration has been reached, resolution could go on until all the inflammatory products had been absorbed, but in most cases we get new vessels developed in the cornea, and these always remain and can be recognized as small thread-like lines running in all directions, years after they have ceased to carry blood, and their presence forms the readiest means of proof that a certain eye has suffered from this disease at one time. This fact may be of great importance from the medico-legal point of view. Now, although these vessels may have degenerated to mere threads, which are invisible to the unaided eye, yet it is astonishing to see with what great rapidity an eye in this condition may become acutely inflamed, and in the course of a few days, or even hours, may be in the condition of an advanced form of vascular keratitis.

Such cases can only be explained on the supposition that the vessels are really still present, and can become functionally active after a sufficient stimulus has been applied. The onset is far too rapid in many cases to suppose that actually new vessels have been formed in the time. This theory is borne out by microscopic examination of eyes which at some remote period had suffered from interstitial keratitis. The minute network in the parenchyma of the cornea makes but little appreciable defect of vision, and, supposing all the infiltration be cleared up, the eye should see nearly as well after as before an attack. Unfortunately, however, this by no means always happens, large infiltrated patches often remain for years, not to mention the results of those more severe cases when the cornea gets ulcerated and we have not only the old infiltration to deal with, but also a dense scar as well,

A good deal of attention has been paid to the electrical treatment of these patches, and a gentle current of about 1 milliampere is passed through them by means of an electrode, which is made to touch the cornea while the circuit is completed by the other electrode being placed on the forehead or elsewhere. The practical effect of this must be a somewhat powerful stimulation of the part thus treated, and supposing the opacity is due only to an area which is infiltrated with inflammatory products no doubt the lymph stream in the cornea is hastened, and this may lead to the carrying away of those products which are deposited between the bundles of fibers. But, on the other hand, when actual scars are present which are due to the healing of ulcerated parts, it seems to me utterly opposed to all known physiological principles to suppose that the scar can become absorbed and replaced by healthy tissue by means of a feeble electric current. I do not for a moment deny that such a procedure may aid thinning of an opacity, even if it be in part due to a scar, but that it can do more than this (as some people claim,) seems to me to be impossible.

Ung. hydrarg. ox. flav. is a well-tried remedy, and from its stimulating action it certainly aids the clearing of the infiltrated patches in the later stages of the disease.

The extreme importance of this disease and the erroneous way in which it is sometimes regarded, is my excuse for trying to point out more accurately its pathology and rational treatment.

GLAUCOMA; ITS SYMPTOMS, VARIETIES, PATHOLOGY AND TREATMENT.

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CHAPTER XI—Continued.

(Continued from Vol. VI., No. 2.)

age 50, had simple glaucoma of the left eye, with contracted field. Right had perfect field and no symptoms; discs much alike, having large cups on the external sides and broad belts of nerve tissue on the internal. John S., age 51, in August, 1879, had advanced chronic glaucoma in the left eye, while in the right there was no glaucoma. Vision $^{6}/_{9}$, with —.75 D, a large, circular and very deep physiological cup. Three years later the left eye was quite blind and the right remained as before. These cases show that even "physiological" cups must at times be viewed with suspicion of glaucoma.

Nettleship suggested that natural variations of resistance in the lamina cribrosa may have effect in producing abnormal disc appearances, and said: "I think it likely that a very large physiological cup shows a predisposition to the further yielding that will constitute glaucoma." Then one sometimes sees cases of simple glaucoma in which the "first thing observed is a nearly central defect in the form of one or more scotomata near to or partly surrounding the center, and without any contraction of the periphery. These cases are amongst those as to the nature of which there is much difference of opinion, many surgeons looking upon them as peculiar varieties of primary uncomplicated atrophy of the optic nerve rather than glaucoma." Nettleship, while admitting that this is a "difficult point to settle," quoted a case to show that "although in some of the cases of very quiet, doubtful glaucoma T is never decidedly raised, and variations of sight are absent," an "early failure of the central part of the field is compatible with both these cardinal symptoms of glaucoma."

Priestley Smith (8) said: "Some writers, however, still deny that what we call glaucoma is necessarily connected with increased pressure. They point to certain exceptional cases in which the contracted field and the excavated disc are found in company with normal tension, and on the strength of these exceptions they maintain that glaucoma is the expression of some unknown agent which usually raises the pressure and excavates the disc at the same time, but which occasionally excavates the disc without raising the pressure. This assumption is, I think, unnecessary. The excess of pressure is sometimes slight: it is often intermittent; it may even be absent for long periods of time; it is very probable, therefore, that these cases of glaucoma with normal tension are cases which have been examined only during the intermissions of increased tension. Permit me to mention a case: Sir William Bowman was consulted by a lady in 1865. He noted—and he has kindly placed the notes at my disposal—increased tension and commencing excavation, diagnosed glaucoma, and spoke of iridectomy. No operation was performed. Twenty years later this lady came under my own care with deeply excavated discs, contracted fields, and impaired vision. I saw her many times; sometimes the tension was quite normal, sometimes it was decidedly increased," (*e. g.*, one day at 5 p.m. quite normal in both eyes, at 11 p.m., when tired, decidedly in excess, the pupils being larger than before); "vision was still useful, but failing rather rapidly." Iridectomy was performed on both eyes with good result. "Now, this lady must have had for years an unmistakable glaucoma, but at times, and probably very frequently, a normal tension. Yet, pressure was there at the beginning, and it was there at the end. I cannot doubt that it was an essential factor in the process." Now, according to Priestley Smith's own teaching, if there is pressure there should also be apposition at the periphery between iris and cornea, and yet we know that the anterior chamber has sometimes the appearance of normal depth in these cases. But, as this author remarks, eyes are not removed for simple glaucoma until a marked increase of tension and pain have supervened, or, should they be, the very excision would probably permit the parts to resume their natural positions, as it is well known sometimes happens. And also the mere fact that the shallowing of the anterior chamber is not visible from without in no way proves that the iris and cornea are not in contact where the former is cut off from view behind the corneo-scleral junction. It is sometimes seen in eyes excised for glaucoma that at the point where the adherent iris leaves the cornea it forms an abrupt bend, which would tend in the living eye to give an appearance of depth to the anterior chamber, and Treacher Collins (9), who has noted this peculiarity, observed, like Priestley Smith, that a closed angle is quite compatible with a deep anterior chamber. Stedman Bull (10) found the anterior chamber generally shallow, and the iris more or less mobile, except where the glaucoma was absolute. The tension was normal in both eyes in 2 out of 90 cases. The interval between the attack on the first and that on the second eye varied from 2 months to 12 years in the 26 cases in which this could be accurately ascertained; in 7 eyes no cup was visible. Among this large number of cases there was apparently little difficulty in diagnosing all as glaucoma, and most of them seem to have had a typical shallow anterior chamber and increased tension. Rheindorf (11) thought v. Graefe's designation of "amaurosis" still applicable to simple glaucoma, which is not glaucoma at all; also that in some of these cases the distinctly high tension is due to a continuation of an increased brain pressure into the eye in cases of syphilis, traumatism or hydrocephalus. Schweigger (12) has strongly upheld the theory that only a certain number of cases of so-called glaucoma simplex have any right to be classified as such, in which, as he says, increase of tension is a necessary feature. Glaucoma simplex should be divided into (1) true glaucoma without inflammatory signs, and (2) diseased optic nerve with pre-existing physiological excavation. "The ophthalmoscopical picture of a physioiogical cup may be produced by glaucoma, just as extensive normal excavation with discoloration of the disc cannot be distinguished from excavation due to intra-ocular pressure." "Physiologial excavations are always bilateral, but are not always identical in size and location." While Schweigger admitted the possibility of glaucomatous excavation without any sign of inflammation in the eye, he considered any abnormal condition of the pupil as an indication of a past inflammatory attack. "I conclude," he said, "that the course of the disease is marked by distinct attacks of increased tension which come on, and (in the early stages at least,) again subside," some of them apparently non-inflammatory. The writer has seen in Prof. Schweigger's clinic in Berlin several cases diagnosed as optic atrophy, which would certainly by many ophthalmologists have been named glaucoma. Schweigger's opinions may usefully be compared with what has been quoted above from Nettleship. Fuchs (13), holding that glaucoma simplex *is* glaucoma, though occasionally difficult to diagnose from optic atrophy with exceptionally deep excavation, says that in these cases where increase of tension is very doubtful, we must suppose a "lamina cribrosa of special weakness, so that it will give back before a pressure not markedly raised above the normal." We have already seen that such a hypothesis may be unnecessary, and that, although hidden from outward inspection, the changes found at the anterior part of the eye in acute glaucoma are probably usually present also in a mild degree in the simple chronic form. But the frequently apparently normal condition of the anterior section, and the comparatively constant pathological changes at the disc have led certain authors to associate true simple glaucoma entirely with a diseased condition of the optic nerve or its sheaths, where they think it begins and may end. This supposition has been already considered. and the conclusion formed that it is greatly wanting in substantial evidence. Zentmayer and Wm. Campbell Posey (14), assistant surgeons in the Wills Eye Hospital, Philadelphia, have recently published a careful analysis of 167 cases of simple glaucoma which have been observed there in the clinics of Norris and Oliver. This number represents .736 per cent. of 22.680 patients, 10,591 of whom were males and 12.089 females, with 85 male and 82 female cases of simple glaucoma. The notes made by Zentmayer and Posey bear out the already known fact that, though simple glaucoma occurs occasionally early in life (they noticed a case at 13), it is markedly more frequent after 50. and from 55 to 65 is its favorite decade. They endeavored to discover whether any systemic disease has any noticeable tendency to its production, and concluded that 21 cases of rheumatism and 7 of influenza were a sufficient basis for placing these in that category. Of the 167 cases 39 sought treatment on account of failing sight. 19 on account of presbyopia, 19 on account of ocular pain, 5 on account of headache, and 3 on account of asthenopia, and in a number of cases the disease was accidentally discovered in patients suffering from conjunctivitis and other affections. In 36 glaucomatous eyes central visual acuity was normal. In only 13 cases was there normal vision in the whole field of one of the eyes. On an average 20 months elapsed after the attack on the first eye before the second became affected, and 3¼ years between the first signs of failing sight and the time at which a surgeon was first consulted. About 2½ years was the average interval between the first appearance of the disease and the total blindness. In 32 eyes with full visual acuity there were distinct glaucomatous excavations. The anterior scleral vessels were engorged in 28 instances, the cornea was steamy or "needle-stuck" in 58, anæsthetic in 22, irregular and maculated in

10. In 64 eyes the anterior chamber was shallowed and the disc excavated. In 10 cases the anterior chamber was shallow and the disc not excavated. In 3 eyes the disc was excavated, but the anterior chamber was normal. In 15 cases where the anterior chamber was markedly narrowed the tension was noted as being normal. "The shallowing of the anterior chamber exists in eyes where there is no excavation, but the converse is not true, for in every eye where there is an excavation the chamber will be shallowed." * * * "The larger the pupil the le will be the reaction to light." Increased tension was not in 32.63 per cent. of the cases. In only 4.52 per cen were there signs of irritation in the anterior segment of the eye. In 35.6 per cent. of the cases with excavation there was also enlarged pupil. Lenticular opacities existed in 95 instances, and vitreous opacities in 6. Where there were excavations the disc was always discolored, from a reddish gray, the most common, to a blue and green; and the average depth of the cup was 3.37 D. The total number of eyes possessing normal tension and pathological excavation was 72. The form field was contracted on the average to 34.83° on the nasal side, to 50.10° on the temporal, to 31.75° above, and to 43.71° below. The contraction for red was to 20.53° on the nasal side, to 31.75° on the temporal, to 19.35° above and to 24.52° below. Seventeen cases in which the form field was abolished gave an average contraction for the candle field to 26.27° on the nasal side, to 33.81° on the temporal, to 34.81° above, and to 40.45° below. In the majority of cases the contraction was concentric and proceeded *pari passu* for form and color, but in 32 the field for color was less than that for form. In 24.46 per cent. there was a tendency for the field to be cut in the form of sectors, but in no one special position. Scotomata were noted in four instances. By a comparative study of 121 cases the authors concluded that a diminution in vision, a contraction in the field, and the presence of excavation go hand-in-hand. A spontaneous venous pulse occurred in 22 cases, (a remarkably small proportion) and an arterial in 14. In about 20 per cent. of the cases the choroid was described as congested. Hypermetropic eyes were much more frequently attacked than emmetropic and myopic, but not so relatively to their frequency in the general population, and high degrees were no more liable than low degrees, 1.66 D.

being the average. "From observations elsewhere the authors are confident that astigmatism against the rule occurs in the vast majority of cases of glaucoma, and it has been a great disappointment that this belief was not substantiated by this series of cases."

We are taking it for granted that all these 167 cases were pure glaucoma, though the authors do not say in what way, *e. g.*, the 72 eyes with "pathological excavations" and normal tension were differentiated from optic atrophy, or what kind of pathological excavations existed in the 32 eyes with normal visual acuity. These points are to be noted because the authors had previously stated generally that the excavations were of all varieties, and varying degrees of depth and extent. Sixty-five were complete, 7 were undermined, 9 shallow, involving the entire surface. They go on to draw from these cases the very important conclusion that, "the relative amount of contraction in the form and color field often adopted in the distinction between an atrophic and a glaucomatous excavation is valueless, as the findings show that in quite a large proportion 13.06 per cent. of the cases the color field was relatively more affected than the form. "Indeed in 16 of these 32 cases (50 per cent.) the form field was normal, whilst that for red was contracted to 20 or less. Contrary to the findings of other observers, the most frequent type of the restriction of the visual field consists in concentric limitation of the entire field and in the contraction to the nasal side."

Whatever be our belief concerning the etiology of simple glaucoma, the fact remains that practical surgeons occasionally meet with cases which they find difficult of diagnosis and an important question arises:—Is there any known means by which the two diseases can be definitely separated?

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CHAPTER XII.

DIAGNOSIS AND PROGNOSIS.

Diagnosis.

While the principal difficulty in diagnosis lies in distinguishing simple glaucoma from optic atrophy, there are a few points which have been already briefly referred to, and which are worthy of mention again in this connection, so much evil having arisen from a failure, on the part chiefly of the general practitioner to, correctly understand cases, especially of acute glaucoma.

First, it should be noted that glaucoma may be attended by symptoms of fever; that the skin in the neighborhood of the orbit may have an erysipelatous aspect; that the pain may resemble that of rheumatism or neuralgia of that side of the head, and even extend to the shoulder, and that when associated with vomiting it may provoke a diagnosis of sick headache, etc. Locally, it may be mistaken for some form of conjunctivitis. for keratitis, for iritis, for cataract, for opaque vitreous, or for optic atrophy. In all these increased tension, which is always present in cases of glaucoma which are at all acute, will at once direct the surgeon in the right direction, as will cupping of the disc or retinal pulsation when present. From conjunctivitis it can further be distinguished by the opacity of the cornea, the shallow anterior chamber, and by the dilated and comparatively motionless pupil, as well as by the enlargement of the ciliary vessels; from keratitis by an absence of constitutional cause, the position and nature of the corneal opacity, and the state of the pupil; from iritis by dilatation of the pupil, which in iritis is contracted, by the absence of posterior synechia and the depth of the anterior chamber. The possibility of "iritis serosa," properly cyclitis, with raised tension and deep anterior chamber, virtually a form of glaucoma, should be borne in mind. Glaucoma is to be distinguished from cataract because glaucoma with a clear lens does not really resemble cataract in any respect; on the other hand, glaucoma may arise from the swelling of a wounded lens, when the history and appearance of the lens should suffice for guidance. But further, glaucoma may supervene in a cataractous eye, or cataract may supervene in a glaucomatous eye. Both of these conditions should be at once apparent to the careful examiner, though he may be in some doubt as to which had priority in point of time. "The cataracta glaucomatosa reveals itself in marked swelling, bluish-white color, and a lively silken reflex from its surface, whilst cataract in oculo-glaucomatoso possesses the appearance which corresponds to its origin and nature"; in opaque vitreous the cornea and lens are clear, while the opacities themselves are visible.

Besides the above points of difference the history must always be considered; while in certain cases other symptoms of glaucoma not mentioned, such as true glaucomatous halos, may prove of assistance in arriving at a correct conclusion. In those uncommon cases where a diagnosis cannot be made without difficulty between glaucoma and optic atrophy, owing to the absence of satisfactory symptoms in the depth of the anterior chamber, in the size and shape of the pupil, in the condition of the fundus and of the tension, one has to rely upon certain other points which, however, do not in every case with sufficient distinctness supply the desired information. Thus, visual fields are in glaucoma more usually contracted on the nasal side, the retention of peripheral color vision is longer in glaucoma, in which also the light minimum is much higher than normal, while the light difference is apt to be little affected, the opposite of which obtains in optic atrophy. When a large "physiological" cup is found in one eye only, it is really glaucomatous. Also, very slight pressure on the globe may produce pulsation in the retinal arteries in glaucoma. In the discussion on the subject of simple glaucoma which was introduced by Nettleship at the meeting of the British Medical Association in London in 1885, he put the question whether optic atrophy with "glaucomatous" cupping, occurring during the glaucomatous period of life, unaccompanied by true color blindness or by the smallest indication of disease of the central nervous system, linked also by imperceptible gradations with typical chronic glaucoma should be looked upon as glaucoma or as optic atrophy? For himself, he answered that when the disc shows well marked glaucomatous cupping the case should almost without exception be looked upon and dealt with as glaucoma, whether increased tension and other common signs be present or not. Probably where the tension is low the lamina cribrosa is weak, and yields to slight pressure. Meyer (Paris) could not agree with Nettleship, and thought such cases were optic atrophy. Priestley Smith desired a greater agreement in a definition of glaucoma, and said that it meant to him a morbid process depending essentially upon raised intra-ocular pressure. He advocated the more general use of the tonometer as an aid in settling the question. In a recent address before the Academy of Medicine of Paris, Galezowski has endeavored to clearly differentiate between ataxic and glaucomatous atrophies of the optic disc. He affirms that if the affection is glaucomatous, 1, the disc is white, more especially on the external side; 2, the central veins of the optic nerve are diminished in size at the point of emergence, but after crossing with the central arteries, most frequently near the edge of the disc, they become larger; 3, pulsation of the central artery is seen; 4, the pupil contracts to light but is enlarged and irregular; 5, the visual field is narrowed in the internal or superior-internal portion, while it remains normal, at least for a long time in the external and inferior portions; 6, dyschromatopsia does not exist at the beginning of the disease, and is hardly appreciable later, when the opaque zone of the internal visual field has reached the central point of vision; 7, the patella reflexes are preserved and there are no shooting pains. The disease is of gouty, arthritic, or syphilitic origin. Repeated anterior sclerotomy and general treatment appropriate to the diathesis considerably improve the atrophy of the disc and sometimes even arrest it, as Galezowski has seen in five out of seven cases which have come under his observation.

Reasons Why the Quietest Cases of Simple Glaucoma May Be Real Glaucoma.

We may take it for granted that in doubtful cases the distinct appearance of high tension or of peripheral synechiæ would settle the question in favor of glaucoma, and also that there is no reason why glaucoma and optic atrophy should not co-exist in the same eye. It will also be admitted that it is frequently hard to say whether the tension is raised or not. Brailey thought that many cases of so-called optic atrophy were really glaucoma simplex with Tn. or T?+, and Schweigger (1) has asserted that unless the increase of tension is distinct this symptom is of no value, for one can easily discover high tension if one have only faith enough. It is also known that the normal ocular tension varies with the individual. It is, therefore, certain that what is a normal tension for some eyes is a *plus* tension for others. and it must be just as easy to omit to find a real *plus* tension as to imagine one which is not there. Then how is it that we encounter cases in which there co-exists a combination of a normal tension with glaucomatous halos or rainbows? (*e.g.* Somya 2, and Brailey 3), for we have seen the latter to be due to a slightly œdematous condition of the cornea produced by an unwonted pressure from within the eye. Cases also occur in which the tension is noted as normal, and yet the cornea and iris are in contact at the periphery (*e. g.* Bitzos 4) which is now generally believed to be due to pressure from behind. This combination also appears to militate against the theory of an abnormally weak lamina cribrosa. The statement made by Zentmayer and Posey (5) in describing 167 cases noted in the clinics of Norris and Oliver, that " shallowing of the anterior chamber exists in eyes where there is no excavation, but the converse is not true, for in every eye where there is an excavation the chamber will be shallowed." appears to go a long way toward proving that *plus* tension—as witnessed by the shallow anterior chamber—is or has been always present where there is a true glaucoma cup, *plus* tension meaning an increase of tension as regards the eye involved, and not an increase as measured by a supposed universal normal. It is possible that even the recumbent position at night, the tiredness from the day's work, (glaucomatous patients being generally at their best in the morning) etc., may produce temporary *plus* tension sufficient in the long run to seriously affect the eye. When we know that in the majority of cases of chronic glaucoma heightened tension is distinctly present at one time or another, and that acute glaucomatous attacks not infrequently supervene in such eyes, we should be very chary in throwing over glaucoma because we may not be able to discover any appreciable hardness of the globe. We have seen that in all probability there is an automatic action within the eye whereby a rise of intra-ocular tension due to hypersecretion has the effect of again bringing the tension to normal through pressure on the uveal vessels, preventing further secretion from them. It would appear as if in the quietest forms of simple glaucoma the blood pressure were so low that a comparatively slight rise of intra-ocular tension would attain this result, secretion being again diminished; or, given some hindrance to the escape of fluid, that at any rate the slight increase of the intra-ocular pressure could not be augmented on account of the condition of the vessels. A series of sphygmographic tracings in these cases might, therefore, be interesting. Nettleship has already stated that the tension and organic changes in chronic cases may perhaps be sometimes due to feeble circulation or loss of arterial elasticity.

Again, if we suppose a slight increase of intra-ocular tension to have taken place, but that this does not balance the vascular tension so as to stop secretion from the vessels, we must expect a constantly increasing intra-ocular tension, or else admit that the conditions giving rise to the *plus* tension are always in simple glaucoma of a temporary or intermittent character.*

The acuity of the onset of symptoms would, therefore, appear to bear a direct relationship to the vascular tension in the uvea, or else the cause of their appearance must be of a rapidly fluctuating character. Once the passages are as completely and permanently blocked as they ever become, it is not unreasonable to suppose that after a period of specially high intra-ocular tension, due perhaps to a temporary increase in the vascular pressure, vessels usually given to passing fluid into the eye may take on the temporary role of carrying it away, the tension being greater on their exterior than in their interior. This power of course, could hold good only when such vessels continued to carry fluid, and not when that was interfered with, as by constriction of the emmissary veins.

One must bear in mind that it is easy to be mistaken in the condition of the anterior part of the eye. It is frequently said that because the anterior chamber appears to be of normal depth, there can be no apposition of cornea and iris. Now. the periphery of the iris and of the posterior surface of the cornea are quite invisible because they lie so far back, and adhesion of these two is quite compatible with a deep anterior chamber, whose depth may be increased, too, by a sudden backward bend of the iris at the point at which its corneal attachment ceases. (Treacher Collins 6). The alleged normal character of the anterior chamber is not susceptible of proof, because eyes affected with mere simple glaucoma are not excised, and even in the rare cases in which the filtration angle is found open in glaucoma, signs are not infrequently present that its patency is due to the excision of the globe.

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*Examples of intermittency in ordinary subacute or chronic glaucoma are Bowman's case quoted by Priestley Smith and one by Randolph in the Annals of Ophthalmology, Vol. V, p. 945, in which the cornea exhibited a dense haze daily from 9 a. m. till 2 p. m., and in which the disease took more than four years to develop, V. of $^{20}/_{30}$ being then retained after iridectomy.

Another argument in favor of these cases being true glaucoma is the growing feeling among ophthalmic surgeons that iridectomy is the most satisfactory treatment.

Prognosis.

While in the days before iridectomy the prognosis was almost invariably bad (*e.g.* Desmarres 7), at the present day, thanks to modern methods of diagnosis and treatment, a much more hopeful prospect can frequently be entertained. To go fully into this matter would be merely to repeat much of what has been already written, and a short consideration of some of the more important points in idiopathic glaucoma by which one may be guided must suffice. Nettleship (8) asserted that the occasional extreme chronicity of glaucoma precludes us from "saying with certainty whether the disease ever really stops short of blindness. Such arrest of progress, however, seems now and then to occur in the acute form."

In the acute form by operation we expect to remove so much of the blindness as depends on glaucomatous opacity of the media, and on temporary paralysis of visual nerve structure. The destruction of the latter of course depends upon the severity and duration of the attack, but one should be careful in prophecy, although generally a great deal may be expected from immediate treatment in moderately acute cases of short duration. The actual permanent cure of the disease will result only where a proper and sufficient circulation of the ocular fluids can be reproduced. In cases in which the symptoms are apparently not suscepitible of speedy relief by reduction of the tension, that is to say in the more chronic forms where the visual deficiency is due to lesions of a more permanent nature affecting the intra-ocular structures both anterior and posterior, the surgeon is usually well satisfied if his endeavors succeed in preventing further destruction to the eye, and more than satisfied if they actually improve its seeing powers with the help of the necessary cylinders. The idea is very prevalent that operation, and especially iridectomy, not infrequently in chronic cases with contracted field is quickly followed by a still further contraction which may involve the macula. As early as 1862, v. Graefe (9) pointed out this danger with special reference to myopic eyes, and repeated the observation later (10). Berlin (11) in 1869 reported five cases of simple glaucoma, not myopic, in which just after the operation rapid diminution of the field occurred; and Mauthner, who also quotes the above, at the same time reported a similar experience. The reality of this danger was discussed at the meeting of the British Medical Association in 1895. (See under treatment). Nettleship (12) has found the action of the pupil under eserine to be the best prognostic guide in simple glaucoma, and in all of his successful cases before an iridectomy it reacted well to the miotic. This is explained, as Treacher Collins remarks (13), by the fact that its incapacity for movement is due to adhesion of the iris with the cornea: and when uveal ectropion is also present atrophy of the iritic tissue, the result of this adhesion, may be diagnosed as well. The condition of the field of vision, of the anterior chamber, of the excavation, and of the disc as regards color Nettleship considers to afford no constant guide as to the results of operative measures. "Thus we may say that senile cachexia in its various forms is distinctly unfavorable to operation in chronic glaucoma, and that absence of senility and an active pupil are favorable points." Nettleship expressed himself as having more faith in iridectomy in simple cases than before he had looked specially into his results. Stedman Bull (14) agreed with Nettleship's opinions, except that he thought that the latter had overrated somewhat the value of the condition of the iris as a prognostic guide. The effects of operation on 169 eyes with simple glaucoma were the following:

Vision improved for a time, but a few months later it and the field continued to decrease in	10 eyes
Vision remained unchanged for a year or longer in	36 eyes
Vision became slowly worse in	111 eyes
Vision became rapidly worse in	12 eyes

Knapp, criticising Bull's paper, stated that he was guided more by the iris than by the disc. He considered glaucoma to be a form of degeneration of the vascular structures, evidenced by the condition of the vessels of the iris, and on that basis he has never been deceived in forming a prognosis. Others have written on this subject; as fair examples may be quoted v. Graefe, who found that in simple glaucoma iridectomy cured in fully half the number; in a quarter the disease recurred and was set aside by a second iridectomy; whilst in the remainder the eyes continued to go down hill.

Horner's statistics, given by Sulzer and quoted by Berry (14) from 1861 till 1881, are based upon 103 iridectomies for simple, and 149 for inflammatory glaucoma:

	INFLAMMATORY.	SIMPLE.
Improved	72.5 per cent.	22.3 per cent.
As before operation	11.5 " "	37.0 " "
Vision partly retained	10.0 " "	23.0 " "
Not improved and ultimately lost	6.0 " "	17.7 " "

Gruening (15) in 20 iridectomies for simple glaucoma had 4 eyes become blind, but in most of them the *status quo antea* was retained after many years. Fuchs (16) has found iridectomy cure 19 out of 39 of his own cases; *i. e.*, the vision either did not get worse or was actually improved, and in 20 the eyes in spite of the operation lost ground. These cases had all been followed for from five to ten years after the operation. An important consideration which should not be lost sight of is, that there has been no method of operating common to all surgeons, although without doubt in the vast majority of iridectomies the iris has been excised, which, as we have seen, is a much less certain means of opening up the filtration angle than the more recent procedure of iridectome-dialysis. Fuchs (17) states that in considering the chances of improvement he pays more attention to the color of the papilla and to the caliber of the retinal arteries than to the mere depth of the excavation, but does not speak of the pupil in this connection.

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CHAPTER XIII.

TREATMENT.

PREVENTION: INTERNAL REMEDIES: MYDRIATICS: MIOTICS; ELECTRICITY: OPERATIVE MEASURES; CURE BY SCLERAL PUNCTURE: BY THE SCLERAL INCISION OF IRIDECTOMY.

Preventive Treatment

Can anything be done to prevent the occurrence of glaucoma in persons supposed to be predisposed to it, but in whom no symptom has shown itself? As the disease is sometimes hereditary. Nettleship has advised that the eyes of children of glaucomatous patients should be examined for premonitory symptoms. But especially in advanced life, and more particularly where the size of the cornea is below the average, one should aim at the prevention as far as possible of local congestions by the use of proper glasses, good light, the avoidance of the stooping posture at work, and undue excitement, while a generally healthy condition of the body, and especially of the circulatory system, is maintained.

Internal Remedies.

Before operative measures were recognized as advantageous in glaucoma, treatment consisted in prescribing for constitutional idiosyncrasies, especially gout, attending to the state of the digestive and sexual organs, and the use of local antiphlogistics (Sichel 1), MacKenzie (2) recommended besides bleeding, counter-irritation to the shoulder, etc., careful hygiene. purging. calomel and opium (mercury being useful in deep-seated ocular disease,) anti-neuralgics (belladonna, aconite,) iron and quinine.

It is now recognized that sleep, and even ease of mind, may cut short an acute attack, and morphia. which also tends to contraction of the pupil, or chloral may often be beneficially prescribed, while derangements of the general health, as in all other complaints, should be carefully investigated and treated. The circulatory and digestive systems require special attention, and constipation should be avoided. To gout has long been ascribed an intimate connection with glaucoma, and for this reason anti-gout diet and medicines have been advised by the upholders of this relationship. Richey (3), a firm believer in the hypothesis that glaucoma is gout in the eye, along with arsenic, lithium, salol or salicylate of soda, nitroglycerine, nitrite of amyl, ammonium, taraxacum, colchicum, calomel, nux vomica internally, uses hot baths, and locally eserine or pilocarpine, galvanism, and local massage. With some surgeons salicylate of soda is part of a routine treatment. Sutphen (4) has reported a number of cases without rheumatic history, in which this drug relieved the pain. Strychnine has sometimes been found to improve the visual functions of an optic nerve partially destroyed by glaucoma.

Mydriatics.

The employment of a mydriatic for a glaucomatous eye is generally due to carelessness or ignorance, and with the result of increasing the tension. In the time of MacKenzie it was, as he said, sometimes used in glaucoma to improve vision, but had frequently to be abandoned on account of increase of symptoms. It is rarely in these days that it is used by the skilled ophthalmologist in a recognized case of glaucoma, but there are occasions on which it may be employed with benefit. One of these is in secondary cases due to certain positions of a dislocated lens. Another may be when the tension is the result of the aqueous humor containing albumen and solid matters (see serous iritis) and it is doubtful whether it can do any harm in cases in which the pupillary edge of the iris is bound down to the lens so that the pupil is unable to dilate, though, for the same reason, the benefits of atropin as a local antiphlogistic would be considerably lessened, seeing that its action in iritis probably depends to some extent on the anæmia and muscular rest produced by full dilatation. Noyes (5) has said that he is acquainted with an ophthalmic surgeon who is astigmatic and glaucomatous, and who successfully treats the glaucoma, the nature of which is not stated, by suspending his accommodation by means of atropin and using full correction.

Miotics.*

Calabar bean, it was expected, would heighten the normal tension, and it was found to do so by Adamuek, von Hippel and Gruenhagen, though this has not been borne out by subsequent observers. It had already been used by von Graefe to facilitate the operation of iridectomy by narrowing the pupil. It was used by Laqueur (6) in March, 1876, on the eyes of a woman of 48 years of age, with acute glaucoma, drops of the strength of one-third per cent. being employed with excellent result; and then on a case of secondary glaucoma, due to dislocation of the lens, the tension being reduced to normal in fifteen minutes. It was also employed by Adolph Weber (7) in glaucoma about the same time. In spite of his favorable impression of its effects in glaucomatous tension Laqueur (8) asserted that "physostigmine should in no way set aside iridectomy in acute glaucoma," and others fearing that by its use operation might be unduly postponed argued against even its occasional employment. Since Laqueur's time it is probable that his advice has not been followed so faithfully as it deserved, and that the treatment of glaucoma by miotics has assumed in some places a position more prominent than is wise. There is no doubt that these sometimes will cure, and especially in cases produced by the use of mydriatics or by operation on the other eye, as well as that they are most useful in softening the globe before operation, or to replace operation when for some reason that is contra-indicated. At the same time their substitution for iridectomy in chronic cases has frequently gone too far. Their beneficial action is generally supposed to be the result of the enlargement of the angle of the anterior chamber, due to the thinning of the iris on contraction of the pupil. Coincidentally the iris becomes more hyperæmic and the ciliary muscle is spasmodically contracted. It is therefore obvious that before their use the surgeon should assure himself of the absence of cyclitis or iritis, the latter with posterior synechia having even been produced by eserine in a glaucomatous eye (*e.g.* Gruening 9); and it is apparent also that miotics must be useless when the iris is atrophic, or where from any cause, such as peripheral, synechia in old glaucoma, it is prevented from retracting from the filtration angle. There even appear to be cases of acute or subacute glaucoma without atrophy of the iris, in which eserine has no effect as a miotic, whether or not on account of non-absorption is uncertain. The two miotics in general use are sulphate or salicylate of eserine and nitrate or hydrochlorate of pilocarpine, some surgeons preferring the latter because, as they say, it acts less energetically. The more extreme advocates of pilocarpine sometimes assert that eserin will produce glaucoma where the former will not, and quote the fact that eserin solutions are apt to cloud with fungus, but equally experienced surgeons have found no fault with eserin which is not equally applicable to pilocarpin, and the matter seems to resolve itself into a question of the strength of the solution. Eserin is a much more active agent than pilocarpin, and should be correspondingly diluted. When either is used in a too concentrated form irritation is apt to be set up, and the usual dull pain experienced after its instillation may become excessive. Pilocarpine is employed in a strength of from 1 to 8 grains, and eserine of $\frac{1}{8}$ to 4 grains, to the ounce of water. Probably the most satisfactory way is to begin, as was recommended by Sir William Bowman, with a weak solution of say $\frac{1}{8}$ of a grain of eserine to the ounce, and increase the strength according to circumstances. Priestley Smith thinks 1 grain to the ounce of sulphate of eserine the strongest solution that is ever necessary, and advises the very satisfactory combination of 5 grains of hydrochlorate of cocaine in the ounce of this eserine solution, sufficient to diminish ciliary hyperæmia and excitability, while not strong enough to interfere with the desired miosis.

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*This word is usually spelled "myotics," but, as has been pointed out by Hirschberg, "miotic" is correct, according to the Greek derivation.

Electricity.

Dr. M. F. Pilgrim (11) has recorded 2 cases of acute senile glaucoma, and 1 case of chronic glaucoma in a lady of 29 years of age, in whom the use of a mild galvanic current, " the anode to the nape of the neck and the cathode covered with soft sponge over the affected eyeball, making gentle pressure and moving it too and fro," had an immediately beneficial effect on the tension and pain, and later on the vision. Reversing the current caused increase of pain in the young lady's case. During the subsequent treatment, and, indeed, before the galvanism in the acute cases, pilocarpine was used. The massage of the eyeball should also be noted. Dr. Pilgrim explains the action by quoting Dr. W. J. Morton on a " Possible Electric Polarity of Metabolism and its Relation to Electric Therapeutics and Electric Physiology," thus: All active centers of chemical exchanges are electro-positive. When these are over active, an applied pole decreases the activity and cures the disease, opposite conditions producing the reverse effect. This is a not too modest claim for electro-therapeutics, and those who understand the present position of our knowledge of glaucoma will be chary of giving credence to the alleged powers of galvanism over it, especially in chronic cases.

Richey has also treated simple glaucoma (12) by the application of electricity to the cervical ganglion and the fifth nerve, on the supposition that glaucoma is a vascular disease.

Operations.

It is long since operative measures began to be employed for the treatment of glaucoma. Simple puncture of some part of the globe, in order to diminish the excessive tension, was first tried. Thus MacKenzie (13) employed

Paracentesis of the Cornea,

and found that it sometimes gave transient relief from pain and improvement in vision. Desmarres (14) also had the same experience, and found the beneficial results less lasting than those of puncture through the sclera—frequently only about four hours. v. Graefe in 1857 (15) had observed only two cases in which permanent benefit resulted from the operation. Others had a similar experience. In the high tension resulting from "serous iritis," paracentesis may frequently be employed with the best results. MacKenzie also tried

Puncture of the Sclera,

without lasting benefit. It might be done in front of the iris, "anterior sclerotomy," or behind it, passing through the choroid, "posterior sclerotomy." For the latter he recommended that a broad iris knife, pushed through the sclerotic "toward the center of the vitreous humor, is to be turned a little on its axis and held for a minute or two in the same position, so that the fluid may escape." Other surgeons had continued occasionally to employ it, but usually with only temporary benefit, until it recently came again into prominence. Mauthner (16) in 1878, speaking of "the puncture of the sclerotic with a needle," quoted Middleton, 1835, Richey, 1853, Leport, 1876, and said that Hancock in 1860, made his sclerotomy with a knife or needle through the ciliary muscle. At the ophthalmological congress held in Edinburgh in 1894, Dr. Parent of Paris, said that in France this operation is named after Leport, and Mr. Power claimed it for the English surgeon, Hancock. While it would seem from the above that neither is properly entitled to any honor which may be attached to priority in its use, its value is mainly as an adjunct to iridectomy in cases of malignant glaucoma Weber (17,) and Nicati (18,) or as a preliminary to facilitate this operation. Priestley Smith (19) in 1894, stated that he had already done 50 such preliminary operations without any evil result. · He punctures the sclera with a Graefe knife 5 m.m. only from the outer margin of the cornea, so as to open the vitreous chamber as far forward as possible. The knife is directed toward the center of the globe in order to avoid the lens, and during its withdrawal it is rotated on its axis so as to make an L shaped aperture, more favorable for leakage than is a linear cut. Pressure is applied to the cornea for some twenty seconds or more, to force the lens back and to open the angle. In this way the anterior chamber is deepened and the incision therefore, facilitated, while the dangers of intra-ocular hemorrhage from a more sudden diminution of the intra-ocular tension are no doubt lessened. One may perhaps also find some difficulty in reconciling the generally immediately good effects of iridectomy on a glaucoma originating, according to the theory with which Priestley Smith's name is chiefly associatec, behind the lento-zonular diaphragm; whereas a preliminary posterior sclerotomy with pressure on the cornea will tend to replace the lens and raise the blockade in a manner agreeable to this theory, which he has so laboriously and so successfully worked out. Other surgeons who have adopted this operation, have not all thought it well to incise so far forward; in the writer's experience, a distance of 8 or 10 m.m. from the cornea, as Weber advised, being preferred as less likely to injure the ciliary body. In selecting a position it is well to avoid as far as possible, the vicinity of the recti muscles, close to which, as the writer (20) has observed, the vortex veins are generally to be found piercing the sclera at an average distance of 13 m.m. behind the corneal margin.

The beneficial action of a preliminary posterior sclerotomy in difficult cases of iridectomy is confirmed by Nicati (21) and Gifford (22), as well as by Abadie, Pflueger, Mac-

Hardie, etc., at the Edinburgh International Ophthalmic Congress, in 1894. Nicati (23) uses "equatorial sclerotomy" to re-establish the anterior chamber, etc., when necessary.

In spite of the harmless character which has been given to this operation by its advocates, one at least of the dangers which must occur to every one as a possible sequela, has once been found as a reality by Treacher Collins (24). Suppuration followed the incision and the eye had to be removed. "Sections across the line of puncture show a prolapse of the vitreous—much infiltration, with pus cells lying in it. It must have been along this prolapse of vitreous that the suppurative infection had gained access to the interior of the eye."

Iridectomy.

The discovery of the value of iridectomy, whether as some assert, by a happy chance, or as a result of reasoning from observation of its effects on other cases, may be left, even alone, to keep v. Graefe's name forever prominent in the annals of ophthalmic science. He wrote in 1856 (25) that four years previously he first did the operation of coremorphosis, or the production of an artificial pupil, in a case of recurrent iritis with occluded pupil and bulging forward of the iris, complicated by choroiditis, the posterior synechia being, he thought, the cause of the recurrences. The return of good vision he put down to improvement in the choroid. In 1857 (26), when he found paracentesis gave only a temporary effect, he began to think of some way to reduce tension permanently. Just about this time he was doing iridectomy for irido-choroiditis. He said, "it was chiefly the uses of iridectomy in ulceration and infiltration of the cornea which led up to my use of it for lowering the tension," but he had also noted its beneficial effects in staphylomatous eyes, which frequently are glaucomatous in their tension. He first actually tried iridectomy in glaucoma in June, 1856 (27). In 1858, Desmarres (28) writing on glaucoma, stated it to be incurable, but observed that v. Graefe had addressed a note in 1857 to the Institute of France, on the subject of iridectomy. "If these researches," he said, "are confirmed, this will be certainly an important application of iridectomy," but he doubted if their results would be more lasting than those of puncture of the sclera. In 1862

Bowman (29) asserted that some ophthalmic surgeons had not yet been converted to a belief in the use of iridectomy in glaucoma; but in the time that has elapsed since then the smooth current of its popularity has been ruffled only by the question as to the precise means by which its beneficial action is produced, which for a time in the hands of some surgeons gave it a place secondary to sclerotomy, but which has proved of ultimate value in stimulating research into the nature and etiology of the disease. The answers to this question of its action, and to a less extent to the other, whether it can ever be advantageously replaced by any different operation, must occupy a large proportion of what has to be said concerning it.

Benefits of Iridectomy Due to the Scleral Incision.

Something like a decade after v. Graefe's introduction of iridectomy for glaucoma, the necessity of interfering with the iris at all began to be questioned by Stellwag and Wecker, with the result that they both concluded that the important part of the operation lies in the incision in the sclera, though they differed concerning its mode of action. Stellwag (30) first reported the cure of glaucoma by sclerotomy without excision of the iris—two cases— which he explained on the theory that *the new cicatricial tissue stretched itself* according to the intra-ocular tension, which could, therefore, not become excessive. as evidence of which he claimed to have cured a case of glaucoma by merely incising one-third of the thickness of the sclera, (31). To this certain surgeons gave their adherence, among whom were Stilling and v. Hasner. Wecker (32), who had two years previously expressed his opinion that if sclerotomy could be performed without prolapse of the iris the results would be as good as those of iridectomy, at the Heidelberg Congress in 1869 again brought forward this idea. Later, in 1871, we find Stellwag (33), without having changed his ideas, declaring the necessity of excision of the iris, but only to prevent it from prolapsing. In the same year two steps forward of importance were made; one by Quaglino, and the other by Wecker. The former (34) reported 5 cases of the operation, and based his practice on the supposition resembling that of Stellwag, that by it the capacity of the globe was increased, and later, before incising, which he did 2 m.m. behind the corneo-scleral junction, first began the local use of calabar bean to prevent prolapse of the iris, the important step referred to. Wecker, in the mean time, besides reporting on the subject to the Heidelberg meeting of 1871, had perfected the operation by leaving a bridge of uncut tissue which, with the aid of calabar bean, greatly enhanced the chance of healing without prolapse of the iris, his chief contribution to the success of the operation. By the year 1873 he had concluded, however, that iridectomy gave better results than sclerotomy, except in cases of absolute glaucoma, or where the iris is too rotten to remove: and the latter fell into comparative disuse in his hands until, under the influence of an idea that *the cicatrix acted as a filter* for the removal of excessive aqueous humor, he was again using it in 1877 (35), but only to once more renounce it except for absolute and hemorrhagic cases (36). Bader (37) in 1876, did sclerotomy with the object of forming a "permanent communication between the aqueous chamber and the subconjunctival space adjoining the scleral wound," which included a third of the whole circumference, the bridge left being composed of cunjunctiva only. Bader himself said of his operation that its only troublesome sequela was occasional bulging of the conjunctiva, or of the conjunctiva and iris, but the impression conveyed by what literature there is on the subject, is that more or less prolapse of the iris was, to say the least of it, frequent. Hirschberg (38), who had seen the operation and its effects in London, condemned it in unmistakable terms; and Mauthner (39) called it a "monstrosity." Bader (40) in 1881 still operated in the same way in order to secure and maintain a staphyloma of the conjunctiva with or without prolapse of the iris. Schnabel (4I) considered that if the mere section of the sclera cured glaucoma at all it did so only by acting as a neurotomy; and later, while admitting that Wecker's "filtration loop" acts just as efficiently in reducing tension, as does either excision of the iris or a mere scleral incision, asserted that these latter are not beneficial as is the first, by forming a new outlet for the pent up fluid, a double corneal fistula. Knies had now, 1878, adopted the theory that iridectomy acted on account of the scleral wound, the removal of the iris being useful only to prevent the occurrence of its prolapse, a case which he published (42) in which the tension became and remained normal, while a corneo-iritic adhesion continued, satisfying him that the aqueous fluid must have found a new exit through the wound. Mauthner, to whose retrospect on the subject of sclerotomy the writer is in part indebted for some of the above details (43), was also, on the whole, a believer in the efficacy of the scleral incision, as opposed to the excision of the iris, though he considered that the proper explanation of the action of iridectomy had probably yet to be discovered. Sclerotomy, he said, acted "just the same as iridectomy," and should be employed in the prodromal stage in glaucoma simplex early, in chronic glaucoma where there is a defect of the field near the fixation point, and in congenital hydrophthalmos, as well as in glaucoma from dislocation of the lens, glaucoma hæmorrhagicum, and glaucoma absolutum. Brailey, in 1881, gave it as his opinion that (44) when the iris is too adherent to the cornea to be removed, sclerotomy, where it is effective, acts by making a new *access to Schlemm's canal*. Nettleship, in 1888, (45) wrote: "So much of the future as depends upon the maintenance of normal tension will be distinctly favored by a porous scar; but, if the patient be old, and his tissues degenerated, such a scar may act unfavorably by increasing the likelihood of slow inflammatory processes," and possibly by acute infective inflammation. Snellen (46) wrote: "Should it be proved, as I think it will, that the essential part of the operation is the scleral wound, it will be necessary in many cases to combine an iridectomy with it, because when the pressure is high the iris very easily prolapses, and is apt to check the free escape of fluid from the chamber. Accurate measurements of the corneal curvature before and after sclerotomy and iridectomy, have shown that a certain flattening of the cornea results from the operation, especially when the eye is hard. This flattening cannot occur except as a result of an ectasia at the margin of the sclera, and at the same time the ciliary body must be removed from its previous contact with the lens by this yielding of the sclera. In my opinion, the effect of our glaucoma operations depends on *restoring the perilenticular space* through the anterior ectasia of the outer coat of the eye." Priestley Smith's (47) experience has led him to believe that Wecker's explanation of the action of iridectomy, the formation of a permanent filtration cicatrix, or the establishment of communication with the veins, holds true in a very considerable number of cases. "The lips of the wound do not come into close apposition, and the overlying conjunctiva remains slightly elevated by the fluid which collects beneath it." Sometimes a visible extrusion of fluid into the conjunctiva can be produced weeks after the operation by pressure with the finger, with a consequent slackening of the globe, so much so, that Dianoux has recommended its systematic employment after sclerotomy, (48). Speaking on this subject in 1893, Koenigstein (49) says: "When a small cystoid cicatrix exists, massage of the eye drives fluid out visibly, and some authors advise massage, and some do it before the operation, but this is harmful in acute cases. Others even intentionally let the iris heal in the wound (cicatrisotomy)." Priestley Smith has examined one eye cured of glaucoma by operation, but excised twenty years later for pain, redness, and tenderness, without increase of tension, of 2 years' duration. He found that the wounded surfaces had united incompletely, that iris tissue was included between them in places, and that there were small open channels passing completely through the corneo-sclera, and leading into an open space beneath the thickened and elevated conjunctiva. This form of cure, he thinks, is most conspicuously present where the operation has been performed late. and in which a complete restitution of the filtration angle can hardly be expected. "Moreover, the fistulous condition, when strongly marked, appears to expose the eye to some additional risk from septic inflammation in the future." Then he says that the success of sclerotomy in many cases "proves that the essential part of an iridectomy is the incision of the sclera, not the excision of the iris; it does not prove, however, that the latter step is better omitted." In 1894, (50) Priestley Smith remarked that "it is generally recognized that the efficiency of a glaucoma iridectomy depends essentially upon the corneo-scleral incision, and that the removal of a portion of the iris is necessary only for the prevention of subsequent complications," and in July of the same year (51) speaking of an operation on a young patient, he said, that its result, "so far in the present case is a satisfactory filtration scar. with a high degree of astigmatism which was not present before the operation, and which depends on flattening of the cornea in a vertical meridian. It is reasonable to suppose that this change of shape has increased the distance between Schlemm's canal and the margin of the lens in the region of the coloboma, and that although the lens will presumably still enlarge as life advances, filtration may go on at this part of the circle for many years to come." Treacher Collins (52) pointed out that a cystoid cicatrix is always lined by a more or less atrophied iris tissue, a fold of which had prolapsed into the wound. v. Graefe showed that these cicatrices periodically discharge themselves subconjunctivally. In one of the eyes which Collins was able to examine which had been cured of glaucoma by operation, he found that the ciliary body and atrophied iris occupied the gap in the corneo-scleral tissue, and that the tension had been reduced, as he considered, by this new channel of escape for the fluid. Sclerotomy is efficient as a reducer of tension (a) in such a condition, the iris tissue becoming permeable as it atrophies; (b) when by the escape of the aqueous the iris is displaced from its apposition with the cornea: (c) when a permanent gap is formed in the adherent root of the iris through which the aqueous passes directly from the posterior chamber to the filtration area.

While it must be admitted that the evidence brought forward in the above arguments is sufficient to show that in all probability it is the scleral incision which cures glaucoma in a certain number of cases, care should be taken to distinguish a wound which has united firmly without the inclusion of iris or ciliary processes from one in which part of the uvea is incorporated. It is in the latter case only that we can count it as satisfactorily established that the cicatrix plays the principal role, producing however, at the same time, a condition of things by no means devoid of future danger to the eye. In the former case, Snellen's idea of the enlarged circumlental space fits in with such theories of the etiology of glaucoma as represent its origin from an obstruction in that region. If, however, during the operation the iris and cornea be separated, and ciliary congestion reduced, we have probably in these as good an explanation of reduced tension: if the iris and cornea be not separated, the mere permeability of the perilenticular space will not suffice to permit of filtration from the angle, and if the aqueous continue to possess an exit in the scar, through either the anterior or the posterior chamber, that alone might be sufficient to account for the non-return of the glaucoma. It appears to the writer very doubtful that the scleral incision causes at, or soon after the time of the operation, any bulging likely to open up the perilenticular space, and Priestley Smith's practice of a preliminary posterior sclerotomy appears to forward this view. But if the bulging, which does frequently occur later, affect the sclera so far back as the level of a possible lento-ciliary obstruction, it may in that case very well account, to the minds of those who agree with Priestley Smith in his theory of glaucoma, for the immunity of many eyes operated upon from recurrence of high tension, but only if combined with an open filtration angle, or a leaking wound. Alteration in the shape of the cornea in front of the wound does not, of course, necessarily imply alteration in the shape of the sclera behind it. Along with the arguments advanced in favor of the important action of the scleral incision, the following should be considered: v. Graefe (53), who relinquished his own theory that iridectomy acted by diminishing the secreting surface, wrote in 1869, "the most unfortunate of all (theories is) that which refers the effect simply to the wound in the capsule of the globe." Del Monte (54), and Laqueur (55), have seen iridectomy control glaucoma. when the incision has been entirely in the cornea. Schweigger (56) said that even the most peripheral wound lies chiefly in the cornea, that it heals by direct union, and not as Stellwag asserted, with interposition of new tissue. and Quaglino, at the International Congress in London, in 1872, was no longer able to support Stellwag's hypothesis. Wecker, as we have already seen, found after various trials, that sclerotomy was, in practice, inferior to iridectomy. Schnabel (57) wrote, "the scleral cicatrix then possesses no peculiarity of structure by which its reputed function as a filtration tissue could be accounted for." He also asserted that v. Stellwag's opinion, that the cicatrix in the sclera is of loose connective tissue, is wrong. It is neither excision of the iris nor the scleral wound which cures, but a third unknown factor. He performed sclerotomy on one eye and iridectomy on the other, in six cases, and in only one did sclerotomy have as good a result as iridectomy, but this one shows that it is not necessary to touch the vascular tissues. Schoeler (58) showed that in rabbits' eyes, upon which sclerotomies have been performed, filtration is retarded, and not promoted, and that when the intra-ocular pressure was increased in these eyes, the cicatrices remained dry. But Priestley Smith's (59) contention invalidates this argument when applied to eyes with closed filtration angles which, unlike the healthy eye, may possess no other exit for the fluids besides the wound. Nettleship (60) returned to iridectomy in simple glaucoma after a tolerably extensive trial of sclerotomy, fifty cases at least. The results of the latter were often at first good, but later the eyes went down hill. Besides, the operation (he always employed Wecker's) is more difficult of performance. Treacher Collins (61) showed that many so-called scleral incisions lie really as much in the cornea as in the sclera. He pointed out that from the corneo-scleral junction in front at the termination of Bowman's membrane to a point on the globe level with Schlemm's canal the distance is 1.61 m.m., and to the commencement of the ligamentum pectinatum where Descemet's membrane splits it is from the same point 1 m.m. Collins considers it unlikely that the fibrous tissue of a scar should filter any more than the tissues of the cornea and sclera, and "pathologically," he says: "I find in eyes iridectomised for glaucoma good bands of cicatricial tissue, well at the periphery of the chamber, free. for some part of their extent, from any entanglement of iris, where *plus* tension returned and persisted." The object of some surgeons in operating by sclerotomy, is to open up Schlemm's canal. Treacher Collins, in 23 eyes, found that in only 2 had the operation touched the ligamentum pectinatum (in one of which the lens escaped and the ciliary body prolapsed next day), and in none was the canal of Schlemm reached. Most of the incisions passed through both cornea and sclera. Vincentiis (62) says that Wecker's theory of the filtering power of the scar has not been demonstrated. even clinically, and that it rests entirely on conjecture. Besides the above, the various arguments in favor of one or other of the methods of cure said to be dependent upon the removal of the iris must be included in our survey of the subject. as well as the fact of the almost universal preference for iridectomy in by far the greatest number of cases, even in the presence of an iris contracting efficiently to to eserin.

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46. Snellen—Oph. Rev., Feb., 1881, p. 48.
47. Priestley Smith—Glaucoma, p. 147.

48. Dianoux—Arch. d'ophth., Sept-Oct., 1883, p. 405. Oph. Rev., London, II, p. 304.
49. Koenigstein—Wien. Med. Blaet., XVI, 1893, p. 17.
50. Priestley Smith—Oph. Rev., Lon., Jan., 1894.
51. Ditto, July, 1894, p. 226.
52. Treacher Collins—R. L. O. H. Rep., XIII, 2, 1891.
53. v. Graefe—Arch. Oph., XV, 1869, 2, p. 253.
54. Del Monte—Naegele's Jahrsb., 1871, p. 276.
55. Ditto, p. 284.
56. Schweigger—Augenh., 1871.
57. Schnabel—Arch. Oph., N. Y., VII, 1878, p. 12.
58. Schoeler—Trans. Internat. Med. Con., 1881, IV, p. 100.
59. Priestley Smith—Glaucoma, p. 148.
60. Nettleship—Op. Cit., (45).
61. Treacher Collins—R. L. O. H. Rep., XIII, 2, 1891.
62. Vincentiis—Rev. Gen. d'oph., Nov. 30, 1894, p. 1.

CHAPTER XIV.

TREATMENT—(Continued).

GLAUCOMA CURED BY REMOVAL OF THE IRIS TO ITS UTMOST PERIPHERY: BY EXCISION OF THE SPHINCTER IRIDIS: BY MODIFYING THE CIRCULATION IN THE IRIS: BY DIVISION OF THE IRITIC VESSELS: BY THE PRODUCTION OF AN ADVANCED POSITION OF THE CILIARY PROCESSES: BY A COMBINATION OF AGENCIES. UNSUCCESSFUL IRIDECTOMY AND SCLEROTOMY. TREATMENT OF BUPHTHALMIA; OF GLAUCOMA IN APHAKIA: OF HÆMORRHAGIC GLAUCOMA: OF GLAUCOMA SECONDARY TO DISLOCATION OF LENS: OF GLAUCOMA SECONDARY TO SYNECHIA: OF SEROUS IRITIS: AND OF SIMPLE GLAUCOMA.

Removal of Iris to Periphery.

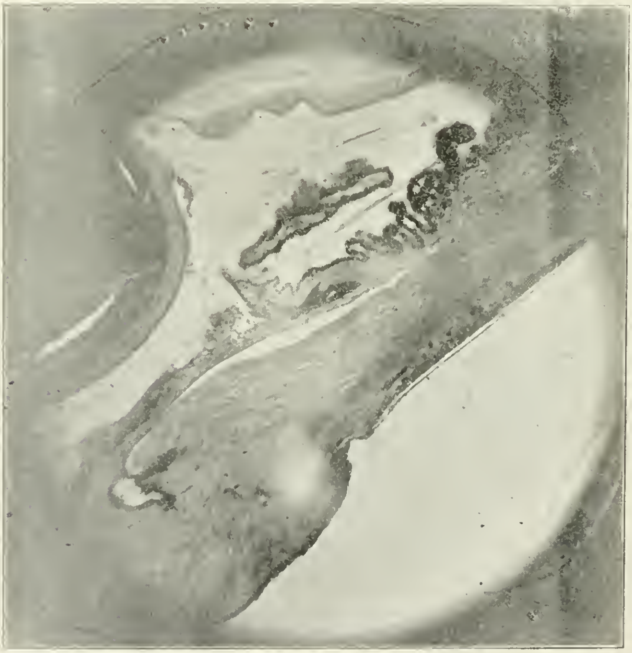

Fig. 12. Return of *plus* Tension after Iridectomy. The root of the iris was very adherent to the cornea, and the operation was not successful in separating them.

The logical sequence of views on the etiology of glaucoma, which consider the apposition of the iris and cornea as an important factor in its production, is that for its cure that part of the iris liable to block the filtration angle should be, if possible, removed. As one would expect from Weber's ideas on the subject (1), he advised that the iris excision should be made for this purpose as peripheral as possible. Brailey (2) thought in 1881 that iridectomy acts by removing the periphery of the iris, and is effective provided that the inflammation is not in an acute stage. Treacher Collins (3) said: "In some other recent and acute cases I have shown that the iris tears away from its extreme root, thus leaving a large portion of the filtration area free for drainage, even should the remainder of the iris retain its faulty position." In two of the four cases cured by iridectomy which he had examined this seemed to be the method of cure, and the mere traction on the iris, or the escape of aqueous may suffice to separate iris and cornea, as evidently occurred in one of his specimens, an acute glaucoma of four days' standing, in which the angle was found open, but with a piece of iris left adhering to the cornea. Vincentiis (4) believes that in performing iridectomy there are two points of special importance; first. the traction exercised on the iris all round it, which effects its base where attached to the cornea; and second, the unfolding of the tissue of the iritic angle. The pressure with the scissors and the traction on the iris are a great strain on the iritic tissue and its connections. This traction and unfolding of the iris will avail only if the section of the iris grasped by the forceps preserves the capacity of transmitting force to the rest of the iris, which cannot happen if it is atrophic. While in old standing cases of glaucoma a cure can comparatively seldom be effected by the above means, the iris and cornea being so frequently inseparably united, it should yet always be the object of the surgeon to remove the iris up to its junction with the ciliary body, which adds another and in recent cases the best chance of benefiting the eye. Treacher Collins has shown that neglect of this important modification of iridectomy has been responsible in many cases for the non-success of the operation. Schnabel (5) did not believe that the operation acted in this way, because he had examined eyes recovered after iridectomy where the iris still remained peripherally attached to the cornea. In others it had been separated by traction at the operation, and in some it had become attached again, and he quoted Knies's case, in which it was known that the tension became normal after an iridectomy which left the obnoxious synechia (6). In answer to Schnabel's objection it may be stated that the above is not claimed as the only method by which glaucoma may be cured. and that these cases were probably benefited by one of the others.

Excision of the Sphincter Iridis.

Von Graefe remained dissatisfied with all explanations of the cure by iridectomy which were given in his time. Yet he wrote (7): "The more sudden the cloudiness of the media with which the disease comes on, the more does the real point of the operation seem to lie in the excision of the sphincter;" and Schweigger (8) said: "In some cases of glaucoma that come for treatment on account of inflammatory symptoms, it is sufficient. as v. Graefe has mentioned, to excise a portion of the sphincter iridis." The proper explanation of this lies, most likely, not in the excision of part of the sphincter, but in the traction applied to the base of the iris, or in the effect of the scleral wound. Delmonte (9), Laqueur (10). Schnabel (11), and Mauthner (12) have seen iridectomy control glaucoma when the sphincter was left intact.

Modification of the Circulation in the Iris.

Some surgeons hold that in some way, concerning which there is little agreement, the removal of a piece of the iris modifies its circulation, and in a manner just as doubtful cures the glaucomatous tension, as v. Graefe had shown it could cure the diminished tension of some cases of irido-cyclitis. Exner asserted that at the edge of the coloboma arteries set up a novel connection directly with the veins, without the interposition of capillaries, which moderates the blood pressure in the iris, and this Schweigger (13) characterized as the only fact of any value relating to the action of iridectomy in glaucoma, a criticism with which he will find few surgeons to agree.

Berry wrote (14): "All that can be said then is that in some way or other, and by reason probably of the changes which the excision of a portion of the iris produces in the circulation in the iris, the operation of iridectomy is capable of effecting an improvement in the conditions of the circulation in the ciliary body and the anterior part of the choroid."

Division of Iritic Vessels.

Brailey (15) suggested, as a result of his observations concerning the enlarged size of the *circulus arteriosus major*, that iridectomy may possibly cure "by *tearing or removing the base of the iris near a dilated vessel*, and that it fails when the tension depends on other causes."

Production of an Advanced Position of the Ciliary Processes.

Schnabel (16) thought that the value of iridectomy might perhaps lie in a forward traction of the ciliary processes, and their permanent retention in that position, but the writer is unable to explain in what manner he considered the benefit to arise.

A Combination of Agencies.

Koenigstein (17) took safe ground and said that iridectomy lessens the secretive surface, divides the nerves, brings the anterior chamber and the vitreous into closer relationship, completely removes the aqueous, dispenses with part of the capillary circulation, and produces a direct connection between iritic arteries and veins, whereby blood pressure, and with it intra-ocular pressure, are lowered, and finally through the traction on the iris and its excision, which should be broad and deep, the angle is reopened. Priestley Smith (18), while in other places more definitely specifying the part of the operation of most importance, yet writes: "In the earlier stages of primary glaucoma, iridectomy seems to act in the following way: In the first place, the escape of aqueous humor and the simultaneous advance of the lens immediately reduce the pressure in both chambers. The obstructed circulation in the uveal tract is relieved by the removal of the pressure, and in many it is further relieved by a free escape of blood from the divided vessels of the iris. Fluid drains away through the wound for some hours, and the overfilled vitreous chamber is depleted. The ciliary processes recede, the pressure on the iris base is relieved, and as the anterior chamber reforms the filtration angle reopens. Iridectomy acts with greater certainty in acute congestive than in chronic non-congestive glaucoma, and it is effective chiefly in the earliest stages of the disease. The reason of this is clear. The pressure on the iris base is more likely to be removed when it is due to vascular congestion than when it depends upon more permanent causes, and the filtration angle is more likely to reopen when the closure is still recent than when it has lasted many days or weeks. In two eyes examined by Fuchs which had been permanently cured of acute glaucoma by iridectomy the filtration angle was patent throughout the whole circle."

Unsuccessful Iridectomy or Sclerotomy.

As a rule, immediately upon the escape of fluid from the section the tension goes down and relief comes to the eye. An unsuccessful operation may show itself as what is called "glaucoma malignum," in which the eye, immediately after the operation, remains hard, the anterior chamber does not reform, and blindness rapidly ensues with much pain. Schweigger (19) wrote: "When glaucoma malignum attacks one eye it follows iridectomy on the other eye, even when the other eye is not affected for years after the first. The cause of the unsatisfactory results of the operation must lie in some obscure structural anomaly inherent in the eye itself." These cases most commonly occur in the simple non-congestive type of the disease. Weber's assertion that the propulsion of the lens toward the cicatrix may interfere with the action of an iridectomy is amply confirmed. Nettleship (20) said that "malignant" cases are sometimes due to a weak suspensory ligament allowing the lens to become dislocated; and Priestley Smith (21), that "the lens may be wounded, swell, and block the wound. The uninjured lens may be driven forward by pressure from behind and so completely block the wound and annihilate the angle of the chamber, so that no fluid escapes from the eye after the first hour or two, and the tension is soon as high as, or higher than before;" while Treacher Collins (22) has shown that an operation may fail from adhesion of the lens to the sclero-corneal cicatrix, so that the lens is displaced forward, its upper border blocking the freshly opened up filtration area, or pushing the iris or ciliary processes forward. This is most liable to occur where the anterior chamber is slow to form, because an excess of plastic material is then thrown out. For the further treatment of these cases the old procedure advised by Weber (23) has been found successful in some cases. (Priestley Smith 24, Nicati 25, etc). Also the lens may be extracted in its capsule, though, as Nettleship (26) observed, unsound intra-ocular vessels are apt to be associated with a weak suspensory ligament. This need not necessarily deter one from the operation, but should always indicate great care during its performance, and it is a question whether a preliminary posterior sclerotomy would not always be advisable. Priestley Smith (27) considered that when Weber's operation fails it will probably be justifiable to reopen the original wound or to make an even larger one, and to attempt to extract the lens through a peripheral opening in the capsule. A discission of the capsule may be subsequently necessary if it adheres to the wound. Glaucoma malignum is one of the cases in which Rheindorf (28) removes the lens, and subsequently passes the knife into the "vitreous depression." An intra-ocular hemorrhage immediately following the opening of the globe is no doubt at times the real origin of the forward displacement of the moveable parts of the eye. At the risk of a second hemorrhage it would be better to operate as above than to see the eye blinded without an attempt to save it. But without the onset of glaucoma malignum, iridectomy and sclerotomy are sometimes of no avail in permanently reducing tension and saving the eye. Thus Brailey (29), in four cases in which operation gave no relief, found in three of them the iris still attached to the cornea; and again, out of twenty cases in which iridectomy had been performed, in six he found the iris incarcerated in the wound, in eleven the iris still adherent to the cornea, and three had had subsequent severe iritis or cyclitis. Brailey remarked that of these operations, scarcely any of which had taken place at Moorfields, only one had been efficiently performed. Priestley Smith (30) has found that "iridectomy sometimes fails; it effects neither a reopening of the filtration angle, nor the formation of vicarious channels. The incision may be too far from the periphery of the chamber; a purely corneal wound is apt to close too quickly, and the resulting cicatrix is less extensible than one which lies largely in scleral tissue. Especially in cases of absolute glaucoma, where a reopening of the filtration angle is out of the question, is such an operation powerless for permanent good." Treacher Collins (31) said that iridectomy or sclerotomy fails when certain already mentioned conditions are absent. Thus *(a)*: When the angle is not opened in making the incision, or drawing on the iris; *(b)*, or when the iris does not tear away at the extreme root because *cut* off, or because too adherent; *(c)*. or because no permanent gap leads out of the posterior chamber. "By far the commonest cause of failure would seem to be the non-removal of the iris up to its extreme periphery" (32). In acute cases the iris is only in apposition with the cornea, while in chronic cases these are adherent. "This is the difference between acute and chronic glaucoma, which renders the operation of iridectomy such a very satisfactory proceeding in the former, and so very unsatisfactory in the latter."

Treatment of Buphthalmia.

In considering what treatment to employ in a case of buphthalmia one must bear in mind the anatomical condition of the eye, chiefly the tenuity of its walls and the stretched and possibly ruptured state of the suspensory ligament. as well as the restlessness of young children. Sclerotomy. and still more iridectomy, are, therefore, attended by the dangers of loss of vitreous, collapse of the globe. intra-ocular hemorrhage. etc.; and operations which have passed off without accident, while sometimes attended with good results, have not by any means been always so. as is to be expected from what we have seen of the etiology of these cases. This is especially so with sclerotomy. or, as pointed out by Treacher Collins (33). when an iridectomy has failed to remove the iris up to its very periphery. With our present better knowledge of the disease early iridectomy will probably come again to the front, but the recent tendency has certainly been to relinquish all operative procedure except perhaps frequent paracenteses. and to substitute entirely the use of miotics.* In secondary cases one's hopes of improvement will of course depend upon how far one can remove the cause. If the glaucoma is dependent on posterior synechia an iridectomy before the iris and cornea have become too firmly united would give a good prospect of at least

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**E. g.* See Panas' book on "Diseases of the Eye," page 525; Snellen on "Treatment of Infantile Glaucoma Leading to Buphthalmos" (34), and Swanzy on "Diseases of the Eye." p. 318, etc.

the prevention of any increase in the destruction of the eye. If due to anterior synechia, one should consider whether it would be possible to divide the iris by means of Lang's twin knives, or to otherwise open up such a communication between the posterior chamber and the exits from the eye as would be effectual for its drainage, such as by iridectomy, sclerotomy, or one of the newer operations.

Treatment in Aphakia.

In Stoelting's case section through the capsule, two sclerotomies, one iridectomy, and tearing the capsule were all of no avail. One of Mittermaier's cases was cured by iridectomy, and eserin reduced the tension in two others. In Natanson's first group, in which the increase of tension came on during the after treatment, miotics proved of little use; while iridectomy had good results in two, slight in four, and none in one case; sclerotomy in one advanced case was of no use; and four of the eyes had to be excised. In his second group, in which the increase of tension appeared several years after the extraction, iridectomy was done in several cases, but only once with success. Treacher Collins (34) advises an endeavor to prevent such cases by encouraging rapid healing of the wound, by leaving little lens cortex behind, and when needling by the use of such an instrument as will block the aperture in the cornea so that the risk of capsule, etc., being carried into it by escaping aqueous may be prevented. Swanzy, no doubt as a result of Collins' investigations, advises (35) that after extraction the wound should be searched with a bent iris forceps from end to end for tags of capsule, etc., which might prove a source of danger after it had healed. Paracenteses, sclerotomies, curette evacuations, and suctions had been tried in the cases published by Collins, but unsuccessfully; and in only one had he (in 1890) seen the glaucoma permanently cured by operation, an iridectomy followed by incision in the lens capsule. Knapp, whose custom it is to extract by the simple method, and frequently to needle, later claimed to have cured all his ten cases, one by eserine and the others by iridectomy, normal vitreous escaping each time during the operation.

Treatment of Hemorrhagic Glaucoma.

The writer cannot do better than quote the conclusions of Bourgon (36), who made an exhaustive study of the results of treatment in the recorded cases of hemorrhagic glaucoma, as these have not been modified, so far as he is aware, by any writer since.

The Results of Iridectomy.

"Of 28 operations in 24 patients, 16 patients have denied any amelioration from the operation, and enucleation has been effected 11 times. In 5 other cases it has been proposed, but has not been effected on accout of the refusal of the patient." * * * "As a résumé—of 24 patients, 8 alone have found cessation of pain, and 5 of these have had a visual acuity superior to that which they possessed at the moment of the operation; the result is certainly of small satisfaction, but it would appear still more deplorable if one considered Galezowski's case in which a relapse took place only 23 months after the operation, and if one remembered that most of the patients registered as benefited or cured have been observed for only a few months or weeks afterward." * * * "We conclude that iridectomy is an operation to be rejected finally and absolutely in glaucoma hemorrhagicum." *Sclerotomy* "produces results incomparably superior to those of iridectomy; 7 ameliorations in 13 patients represent more than 50 per cent. of successes. *Paracentesis* is useless, and should be proscribed. *Stretching external nasal nerves* (37). The literature on this subject is scanty, and the operation apparently of little service. *Equatorial sclerotomy.* Randolph advised iridectomy, followed by this operation. *Trephining sclera.* Spencer Watson reported one case which remained well for three months and then relapsed. *Sclerotomy with drainage with gold threads* is abandoned by De Wecker, its author. *Quadruple peri-corneal incision.* Galezowski reported one case not since inflamed, but the operation was condemned by De Wecker and Abadie. *Crucial sclerotomy.* Galezowski advised four incisions, the knife penetrating the sclera 3 or 4 m.m. from the cornea, and being pushed from behind forward for ½ a cm. In one case the operation was ineffectual, but in the second the pain was relieved during the three months in which the case was observed.

Conclusion.

(*a*) True hemorrhagic glaucoma gives a very bad local prognosis. (*b*) The ordinary operations for glaucoma, except sclerotomy, are useless and painful, and ought to be abandoned. *(c)* The general prognosis being nearly as grave as the local, the ophthalmologist ought to attract the attention of the patient's ordinary medical attendant to his condition, and especially to his vascular system. *(d)* Treatment ought to be the following: In the hemorrhagic period take care of the general health, and remove congestion from the eye. In the period of confirmed glaucoma. the treatment should first be medicinal; therefore, now add miotics, moist heat, and injections of ergotin in the temple. Bourgon reports that narcotics have all been of no avail (38). Stilling recommended chloral to reduce the *plus* tension. If the above methods are not sufficiently beneficial, then resort must be had to surgery, which may be summed up in the word sclerotomy, simple or equatorial, and if this be unsuccessful, the surgeon should enucleate without trying any other operation.

Treatment of Glaucoma Secondary to Dislocation of the Lens.

In 1876, Laqueur (39) used calabar bean for a case of glaucoma secondary to dislocation of the lens, and reduced the tension to normal in fifteen minutes, and in 1879, Mauthner (40) said: "The conditional supporters of sclerotomy will probably prefer to try it rather than iridectomy in glaucoma after dislocation of the lens." But now one will treat each case according to the manner in which the high tension is being brought about. It will generally appear that the best course to pursue will be to remove the lens, but in deciding upon this step, one must bear in mind the probable loss of vitreous during the operation, on account of rupture of its anterior supports. The age of the patient should also be considered, in deciding the nature of the operation. If the lens lies in the vitreous one will have to decide whether to leave it alone, and perhaps use miotics, or to extract it with a scoop. When in the pupil, or even in the anterior chamber, eserin is likely to do harm by closing more firmly the lymph path to the angle, while a mydriatic by dilating the pupil and drawing the iris away from the lens may open this path, and even permit of the return of the lens to its normal position, on the patient's throwing back his head. Such a case the writer had the opportunity of watching for some months, the lens frequently coming forward into the anterior chamber, but under a mydriatic, it always returned behind the iris, when the high tension disappeared. Ultimately it was removed after a specially severe glaucomatous attack, and with only a slight loss of vitreous. When it is desired to operate upon a case of forward dislocation, it may be well previously to contract the pupil behind the lens, and so prevent it from slipping back behind the iris. If the patient be young, it may be best to remove the lens by needling and subsequent evacuation by suction or the curette.

Treatment of Glaucoma Due to Synechia.

The object of treatment in these cases is to open up the natural exits for the fluid, or to form a new one. This may be done by dividing a narrow tag approximating the cornea to the structures behind it; by making an aperture in an iris extensively adherent in front or behind, and opening up the filtration angle; or by making such an opening through the hull of the eye and the adherent base of the iris into the posterior chamber as will allow a permanent filtration without the necessity of an open passage through the anterior chamber.

Treatment of Serous Iritis.

As might be expected, eserin is usually of little value, and may do positive mischief in "serous iritis." Atropin is sometimes useful from its tendency to diminish the inflammatory state of the ciliary body; but along with mercurials or other internal remedies, tapping of the anterior chamber, which may require to be frequently repeated, will diminish tension and, therefore, the risks to the posterior nervous structures, and remove at least some of the deleterious matters which block the exits; for though the new fluid formed to replace that lost may contain much fibrin, the proportion of solids will probably decrease after each paracentesis. Where these have failed, an iridectomy sometimes has succeeded.

Treatment of Simple Glaucoma.

Iridectomy, the most reliable treatment for acute cases, has been by no means unanimously approved for simple glaucoma. (See prognosis). The reasons for that are apparent—the fact that certain surgeons are in doubt whether such are really cases of glaucoma at all, and still more, because the symptoms being insidious and little marked, eyes are apt to have undergone such pathological changes before the operation as render their tissues little susceptible to improvement, either in position or texture. The comparative failure of iridectomy has, therefore, given rise to a large body of opinion that such cases are better treated by miotics alone, or in combination with internal remedies (see paragraphs on internal remedies); while many surgeons, considering sclerotomy a milder operation, and one followed less frequently by diminution in visual power, prefer it to iridectomy. For example, Noyes (41) preferred to leave cases of simple glaucoma alone, though he sometimes operated, and Galezowski (42) thought that sclerotomy, even if it have to be repeated more than once, is better than iridectomy. Abadie (43) in the slowly but continuously progressive forms of simple glaucoma advises, instead of operation, the administration of from 1 to 2 grammes of potassium bromide and half a gramme of sulphate of quinine in daily doses, along with the local instillation, once daily, of 2 drops of a half per cent. solution of eserin. As soon as the tension has become normal the bromide and quinine should be left off, but a carefully sterilized solution of eserin should be continued indefinitely.

De Wecker, who holds that in *every* case of glaucoma there is increased tension, goes so far as to assert that cases in which iridectomy or sclerotomy prove harmful, are not really glaucoma at all (44). In cases with no rise of tension, "false glaucoma," or optic atrophy, operation is contra-indicated, but miotics will be beneficial by diminishing even the normal tension, and thus reducing the pressure on the optic papilla, weakened by the peripapillary neuritis, which by subsequent exudation-contraction produces the atrophic cup that so resembles that of glaucoma. Mercury and iodides should also be given internally. In doubtful cases and in true simple glaucoma, Wecker advises operation, and sclerotomy preferably, as causing less visual disturbance than iridectomy.

A strong feeling has for some time been growing among another body of surgeons that after all a proper iridectomy is the best founded treatment, and that their results bear this out. Thus, Nettleship (45), in 1888 observed that eserin very rarely stops the progress of chronic glaucoma, though it is valuable in lessening the frequency and severity of the premonitions which often for a long time precede the establishment of the permanent disease, and in checking fluctuations and recurrent threatenings after operation, and found that, on investigating his own results from iridectomy, they proved better than he had expected. The earlier an operation is performed the better, but he has stopped the progress of several cases even at a comparatively late stage.[*]

Stedman Bull (46) advised iridectomy on the worse eye first, at as early a stage as possible, delay being permissible only when vision and the visual field can be frequently tested and a miotic used; and Knapp (in discussing Bull's paper) while he also as a general statement advised early operation, shrank from it "when vision is still good and the visual field for ordinary purposes perfect," for these are the cases in which malignant glaucoma has been specially common in his experience. Gruening (47) in 20 iridectomies did not find any subsequent rapid contraction of the visual field or vision. Four cases became blind in time, but in most the *status quo ante* was retained after many years.

Treacher Collins (48) advised iridectomy before the iris and cornea have become inseparable; and when that has taken place to a marked degree "a sclerotomy performed with the intention of making a permanent gap in the adherent root of the iris would be more likely to succeed." The new operations described by Nicati, Knies, and Vincentiis, should also be considered. The following are the conclusions arrived at by Zentmayer and Posey (49) in a study of 165 cases of simple glaucoma on the books of Norris and Oliver, in their clinics in Philadelphia: "As operative measures are always to be deprecated when other measures are equally valuable, eserin should be employed in all cases of the disease." If, in a month's time the fields are diminishing, iridectomy should be employed. If the field have improved, "there is reason to expect that a beneficial action will be exerted for ten months upon the extent of the field and fifteen upon the visual acuity.

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[*] Nettleship stated that there is a form of mydriasis which may follow upon sclerotomy, and which has a nervo-muscular origin, and he asked: "Is there any intrinsic neural apparatus in the ciliary muscle which, when uncontrolled by higher centers, can cause extreme mydriasis?" such as that which occurred in one of his cases, in which the iris shrank almost completely out of view three weeks after optico-ciliary neurotomy performed after loss of vision due to hemorrhage between the sclera and choroid, with complete temporary insensibility of the globe.

After iridectomy is performed, there is ground to believe that the course of the disease will be checked for a period of eighteen months in 15 per cent. of the cases. Eserin is powerless in 20 per cent.; iridectomy in 10 per cent. of the cases. So that 10 per cent. of all cases of simple glaucoma will not be benefited, despite all therapeutic measures which may be employed."

At a meeting of the British Medical Association in London in 1895, Nettleship, in discussing simple glaucoma, asked whether it is true that iridectomy, performed when the visual field is already lost up to the center, if often followed quickly by a further loss of the visual field which engulfs the center, and thus seriously damages visual acuity? And if so, is it more to be expected when the previous contraction is concentric, than when it has the form of a sector? Nettleship himself had had very few cases of quiet glaucoma in which the visual field had been decreased by operation, and quite a number in which it had then remained undisturbed. "The risk of such further rapid loss of field as a consequence of iridectomy is probably greater *ceteris paribus* when the tension is much increased." Mayer (Paris), when deciding as to the advisability of operation in any individual case, did not consider the state of either the vision or the visual field. Priestley Smith (Birmingham) said that the optic nerve. like other nerves, having once begun to atrophy tends to further atrophy when the nutrition of the nervous system in general fails and, therefore, it is well to care for the general health. Little (Manchester) had not found that iridectomy further contracted the visual fields. Swanzy (Dublin) would not operate when the field was contracted to the fixation point. Frost (London) had found preliminary scleral puncture useful in preventing failure of vision as a result of operation. Nettleship's next question was, whether it was advisable to operate early in simple glaucoma, or for fear of doing harm, to wait? He advocated early operation. and unlike Schweigger, first on the better eye. Before the disease had advanced, the risk was less of displacement of the lens or of internal hemorrhage, the ciliary processes and iris were less likely to be atrophic, and the hope of re-establishing the angle, was greater; also, of course, more vision could be saved. Fuchs (Vienna) had given up operating where there was no increase of tension. Critchett (London), Priestley

Smith, Swanzy, and MacKinlay (London), believed in early operation. Nettleship then went further, and enquired whether it was not well to operate, even in the prodromal stage. He said: "There can hardly be a doubt that if iridectomy were commonly performed in the prodromal stage, the number of persons who become blind of glaucoma would be considerably lessened. The risk of operation carefully done, is very small: the prospects of immunity conferred by it, very great." He advised operation at the earliest opportunity, especially in the young, because he believed glaucoma in them to mean a tendency to weakness of the suspensory ligament and blood vessels. For this reason, he incised further forward in the young. To this rule there were possible exceptions, when a miotic acted efficiently, and the patient could use it properly, and report himself regularly to the surgeon, but it was with dread that he saw such patients drift; also sometimes in the very old, or in otherwise bad subjects. Priestley Smith advised operation at any stage, provided that the patient fully understood the prognosis. Little agreed with Nettleship, that the action of miotics was unsatisfactory. As regards the nature of the operation employed, Nettleship stated that he had, after a prolonged use of it, quite relinquished sclerotomy in favor of iridectomy, except as a second operation when the latter failed, and then he made a Wecker's incision opposite the coloboma. He had used Priestley Smith's preliminary puncture on one or two occasions with satisfactory results, and he had no fault to find with it. Fuchs, Mayer, and Gayet (Lyons) always did iridectomy. Gayet made an equatorial scleral puncture instead of iridectomy when the latter appeared dangerous. Critchett's desire was to produce a cystoid cicatrix. Priestley Smith considered that success depends upon the production of a permanent subconjunctival fistula, and before operation for the avoidance of internal hemorrhage attended to the health of the patient as regards sleep and the action of the bowels and kidneys. If necessary, he slackened the eye by a preliminary scleral puncture. Little always did iridectomy, reserving sclerotomy for cases in which the former failed, when he incised in the region of the coloboma. A cystoid cicatrix was desirable. Power (London) stated that a temporary case, due to mental worry, could be cured by eserin and the treatment of the general health. Panas (Paris) asserted that miotics take the foremost place in treatment, but as their action lasts not more than five hours, they must be instilled at least four times a day. He preferred an ointment composed of vaseline, salicylate of eserin, and hydrochlorate of pilocarpine. When that did not suffice, he did sclerotomy, and reserved iridectomy for cases in which that also failed. Frost did not operate so much now as form erly, from a suspicion that that did not arrest the disease. Williams (Liverpool) said that as sclerotomy was simpler he preferred it. Walker (Liverpool) had long ago given up iridectomy in glaucoma, but endeavored to produce instead, a cystoid cicatrix by dissecting up a flap of conjunctiva, and tucking it through the wound caused by the incision of the sclerotomy into the anterior chamber, which he had found efficacious.

It will be observed that on the whole, the tendency of those present was toward a wider field for iridectomy, but it is to be hoped that in future, in justice to each operation, its nature may be distinctly stated, whether a simple iridectomy, or an iridectome-dialysis.

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CHAPTER XV.

METHODS OF OPERATING.

IRIDECTOMY; ANTERIOR SCLEROTOMY; NICATI'S SCLEROTOMY; KNIES' MODIFIED IRIDECTOMY; VINCENTIIS'S OPERATION; EXTRACTION OF THE LENS; INTRA-OCULAR MYOTOMY OR HYPOSCLERAL CYCLOTOMY; EXCISION OF NASAL NERVES; ENUCLEATION; EVISCERATION; AND OPTICO-CILIARY NEUROTOMY OR NEURECTOMY.

Iridectomy.

It happens not infrequently that the eye is too hard and too congested to absorb cocain sufficiently to dull the sensibility, especially of the iris, and a general anæsthetic is then required. When an iridectomy is about to be performed for glaucoma, it is well to have the eye not to be operated upon under the influence of eserin, as was suggested by Arlt, in order to diminish the risk of a glaucomatous attack in it; and when it has been decided to employ cocain, which answers perfectly in the less congested forms of the disease, the same eye should have its sensibility diminished by the instillation of a weak solution which will not counteract the desired miosis. The use of eucain, which is not a miotic, though it may cause congestion, is probably attended by little danger of producing glaucoma. Before proceeding to the operation, the surgeon will ask himself what it is which he wishes to accomplish. We have already seen what are the probable methods of cure after iridectomy, and the usual causes of failure. His purpose, then, is the re-establishment or formation of a means of exit for the intra-ocular fluid, and his first aim should be to open the filtration angle by removing the iris up to its utmost periphery. This he can do in such cases as have not lasted sufficiently long for firm adhesion to have been set up between iris and cornea, and where the iris is in a fairly healthy condition. Where the adhesion has become secure we cannot hope for good results, unless by the formation of a permanent filtration tissue, communicating with either the anterior or posterior chamber, and these, as we have seen, when successful, are lined by atrophied iris or ciliary structure, a condition dangerous for the future health of the eye; and yet, as

Treacher Collins has said (1), under these circumstances a sclerotomy producing such a permanent gap would give the best possible results. The removal of a portion of the iris being the primary object the surgeon should select the upper part, because there the coloboma may be hidden by the lid; but if any other segment of the iris appears likely to give a better result, that should be preferred, and this better part may sometimes be recognized by the shape of the pupil which is apt to be drawn up where the iritic adhesion is greatest, as well as by the ectropion of the uveal pigment and the shallowness of the anterior chamber, which will be most noticeable in a like position. (Brailey 2, Treacher Collins 3). The incision need not be very peripheral, and the corneo-scleral junction or a little outside of it will do, but it should be made slowly and of considerable length, perhaps one-fifth of the circumference, to give sufficient room for the next step and to add to the chance of including in the removed portion a non-adherent part of the iris. The choice of a knife will vary with the predilection of the operator, but on the whole, a narrow Graefe is probably the best, great care being taken in any case to avoid the lens, and with a Graefe not to saw upon it through the iris with the back of the knife. Treacher Collins (4) has shown that iridectomy cicatrices are always oblique, and especially so when a keratome is used. In 23 eyes examined by him, only two incisions had touched the ligamentum pectinatum, and in one of these the lens escaped and the ciliary body prolapsed next day. In none was Schlemm's canal reached. Most were corneal and scleral combined. Experimentally he found that an incision 2 m.m. from the cornea, the knife cutting perpendicularly out, passes through the central part of the ligamentum pectinatum, and in absolute glaucoma also cuts the iris at puncture and counter-puncture and passes through it as the incision is completed. Opposite the ligamentum pectinatum the anterior ciliary processes lie close behind the iris, protecting the lens, but if the incision be made here, the processes will prolapse. It must, therefore, not be made so peripheral as the spaces of Fontana.

When the anterior chamber is very shallow and the globe hard, preliminary posterior sclerotomy, as practiced by Priestley Smith and others, may be useful in diminishing the risk of wounding the iris and lens, and of intra-ocular hemorrhage. When a Graefe's knife has been inadvertently passed through the iris, it is frequently recommended that the incision be completed as usual, but this is doubtful wisdom, as a divided iris cannot be removed so completely as one which is intact, and it would be better to withdraw the knife to be re-entered, either immediately or only after the refilling of the anterior chamber, according to circumstances. The incision having been completed very slowly, so as to lessen the tension as gradually as possible, some surgeons like to allow a solution of cocaine to enter the anterior chamber along the concavity of the curette in order to diminish sensibility in the iris. The iris forceps should then be passed into the wound, the iris carefully seized close to its pupillary edge and as far to one side as possible, pulled out, snipped vertically on the side of the forceps far from the center of the wound, then by passing the forceps slowly, but firmly, quite to the other end of the corneal incision, the iris is torn away at its thinnest part, its origin from the ciliary body, and not, as is sometimes affirmed, cut by the sharp edge of the corneal wound. This operation differs in essential details from the usual iridectomy, in which the iris is seized and snipped off, with the necessary result that a piece is left behind, and Treacher Collins (5) has proposed to accentuate this difference by resuscitating for it the old term "iridectomedialysis." The tearing away of the iris is the only way to remove it up to its very periphery, and is attended by little or no more hemorrhage than occurs with the use of the scissors.

The edges of the coloboma of the iris are, if necessary, now replaced with a spatula, the lens being carefully avoided, and the eye, or better at first both eyes, bound up. Eserin should never be used until the wounds are healed and the eye has quieted down, for before that stage its chief action is to irritate with considerable probability of the production of iritis.

The full effects of the operation on vision are not generally apparent until some time, perhaps two or three weeks later, when the wounded surfaces have healed, but the amount of the resulting astigmatism remains indefinite for a longer time, owing to the continual contraction of the cicatrical tissue. When both eyes are glaucomatous, the question will arise as to the wisdom of operating upon them at the same time. In acute cases, in which it is important to reduce tension immediately, this should certainly be done, trusting to careful precautions for the avoidance of possible accidents. But when a little delay can make no practical difference. and where other circumstances do not interfere, it is always better not to expose both eyes to possible risk from infection, blows, etc. Schweigger has said (6): "Experience teaches us that in all cases of chronic glaucoma, it is advisable to operate first upon the worse eye, even if it be absolutely blind. Should this be followed by the normal healing process, the second eye may be operated upon without the least apprehension." This may be good advice where the patient is certain to submit to the second operation, but it is probable that, in spite of the most thorough explanation, the first would deter a certain proportion of patients from another operation. Nettleship prefers to begin on the better eye (7). Again, we may well inquire whether it would not sometimes be advisable to operate on a perfectly sound, though *predisposed eye*, whose fellow is already glaucomatous. The answer would seem to depend on circumstances. If the patient is acquainted with the premonitory symptoms, and is within easy reach of a reliable surgeon, the sound eye should be left intact; while operation should be considered when circumstances point to a serious risk of confirmed glaucoma before relief could be obtained. And eserin at least, should always be within the patient's easy reach. Treacher Collins (8) has stated his belief that it is sometimes justifiable to make an iridectomy for preventive purposes, and quotes v. Graefe (9) as asserting that "glaucoma simplex affects almost without exception both eyes successively." Priestley Smith (10) declares that "in the large majority of cases, primary glaucoma is a bilateral affection," and Nettleship (11) that in "something like two-thirds, the disease is sooner or later symmetrical."

Certain *accidents* are liable to happen during or after an operation for glaucoma. Intra-ocular hemorrhage is one of the most frequent, and may have disastrous effects upon the tissues of the eye. The blood is usually absorbed in six or eight weeks, but owing to degenerative tissue changes and too slow circulation in the ocular fluids, it may be delayed even longer. Glaucoma malignum has already been discussed. Where high pressure coexists with a weakened zonule, the lens is in danger of displacement on the escape of the aqueous. A previously clear lens may be found when close examination of the eye is first possible, to be in a state of more or less advanced cataract. This is said by some authorities to be in every case the result of contact with the edge or back of the knife, with the forceps, or the spatula. It may be that this statement is correct, but experience justifies one in doubting its accuracy, while sudden changes in ocular conditions due to the operation might theoretically be as capable of affecting the lens as say, friction on it through the cornea, which is usually believed to possess the power of ripening cataract. For example, it is to the writer's mind very doubtful whether, especially in advanced age the lens is capable of absorbing its normal amount of nutriment from fluids which, while the scleral incision remains open, pass from the eye nearly as soon as they are formed, and besides may not in such circumstances remain of their usual constitution. We have already seen how Nicati and Greef have proved important changes in the aqueous after a simple puncture of the anterior chamber.

In no inconsiderable number of apparently healthy senile lenses where the pupil is well dilated peripheral striæ may be found, and Zentmayer and Posey have noted lenticular opacities in 95 out of 165 eyes suffering from simple glaucoma, or about 60 per cent. Bull (12) reports that iridectomy materially hastened the growth of opacity in the lenses of 20 out of 35 glaucomatous eyes with previous peripheral striæ. When the capsule is actually cut or ruptured, and the lens, absorbing fluid begins to swell. a condition arises in itself liable to cause glaucoma, and very different from that in which there are merely a few striæ to mark the approaching opacity. In the former case the eye is said by Fuchs (13) to be almost certainly lost, and at the best is in considerable danger. for the circumstances are anything but propitious for the extraction of the offending lens.

Anterior Sclerotomy.

In Quaglino's original sclerotomy the scleral incision was made continuous from end to end, but Wecker changed this, in order to diminish the great tendency to iritic prolapse, by leaving a bridge of tissue uncut and his operation, or some slight modification of it, is the one which is still generally in use. But before deciding to operate it should always be ascertained that the iris will react well to a miotic, under whose influence it should very distinctly be at the time of the operation. Otherwise the operation should be avoided. The necessary local or general anæsthetic having been employed, and the second eye being also in a state of miosis, and if cocain be employed also partially insensible, a narrow Graefe's knife is made to puncture, as if for cataract extraction, 1 m.m., however, behind the corneo-scleral junction; but as soon as it enters the aqueous it is, on account of the shallow anterior chamber, directed upward, so as to follow closely the angle of the anterior chamber, insinuating itself slowly around to a point on the other side of the globe opposite the puncture, when it is passed through the sclera, and with a sawing motion the incision is slowly made at the original distance from the cornea till a piece of sclera only some 3 m.m. wide is left uncut, the knife being then withdrawn carefully and with slight pressure forward, in order to completely evacuate the aqueous humor. A subsequent deviation from the circular in the form of the pupil *shows a tendency to a prolapse* of the iris, and if it occur and the iris cannot be gently replaced with a spatula, or even iris forceps, the sclerotomy will have to be turned into an iridectomy. Eserin should be again used, both eyes bandaged, and an examination for prolapse made two or three hours later. The patient should be on his back till the wound is fairly well united. Sometimes a second sclerotomy, or a sclerotomy following an iridectomy, is necessary, and it is then usually made directly opposite the former point; while in some cases, such as at times in serous iritis, it may be necessary to repeat the operation several times, in which case the best method is to use a keratome, making a single incision on each occasion.

Nicati's Sclerotomy.

Nicati (14) has published particulars of an operation which he calls *sclero-iritomy*, whose object is to "place the posterior chamber in direct communication with the meshes of the subconjunctival areolar tissue, and at the same time modify the secretion of the aqueous humor by dividing the nerves of the iris;" and also, he adds later, to "diminish the reflex contractions of the tensor muscle of the choroid,'' which he considers bear an important part in the production and regulation of the ocular tension. ''The puncture, which is made just outside the cornea, penetrates the iris to enter the posterior chamber where the lens is avoided by means of a carefully calculated procedure. The knife, a lancette à arret, is passed under a fold of the conjunctiva in such a manner as to insure a valvular opening at a tangent to the cornea and perpendicular to the plane of the iris.'' He sums up the result of 57 of these operations by saying (15) that *(a)* ''they are remarkably favorable in the treatment of staphyloma following necrosis of the cornea, and especially as a preventive measure against this affection; and *(b)* that the result is mediocre in ordinary glaucoma, on account of the tendency to hyphæma, and because, the incision being perpendicular to the coverings of the eye, the edges of the wound are not separated by alternations of pressure, as they are in an oblique wound formed in an ordinary sclerotomy. The incision tends, consequently, to heal quickly without leaving any curative fistula.'' In 1894 Nicati (16) asserted that this remained the preventive and curative operation for cicatrical staphyloma of the cornea and cicatrical glaucoma. This operation he *modified* for use in ordinary spontaneous glaucoma, performing it with a sharp, narrow knife. ''First stage (intruduction): The blade, edge downward, is introduced through the sclerocornea into the inferior angle of the anterior chamber, placed parallel to the iris in a horizontal direction, and finally pushed along in such a manner as to pierce the sclerotic a second time, beyond which counter-opening the point should be made to project 1 c.m. This corresponds to the first stage of Wecker's sclerotomy. Second stage (rotation)—Giving the blade a quarter turn, it is placed perpendicularly to the iris, with which membrane the edge now lies in close contact. By this maneuver an incision perpendicular to the first is made in the sclerotic and the aqueous humor escapes. Third stage (extraction)—The blade is rapidly withdrawn in the same plane, as in the second position. In doing this the iris is divided along its line of attachment to an equal extent to the contact with the edge of the knife. It goes without saying, that care should be taken to remove all that is possible of the blood poured into the anterior chamber as a result of the section of the iris. As far as that is concerned, however, the depending portion of the wound favors the spontaneous evacuation of the blood. This operation fulfills the indication which requires that the scleral wound should gape easily, since not only is the incision not perpendicular to the sclerotic, but by the second step of the operation it is transformed into a genuine V shaped flap, a form of wound that insures the flow of the aqueous humor better than any other. The operation fulfills also, the indication of dividing freely the nerves of the iris, constituting a thorough iridian neurotomy, which is capable of diminishing the secretory impulses reflected from the membrane. It obeys the call for a good glaucoma operation, such as we have established it to be in a physiological aud pathological study of the glands of the aqueous humor." (See Nicati's theory). He sums up this procedure by saying, that it "becomes the operation of choice for spontaneous glaucoma." Nicati has not yet published his results by this operation, but Monk (17) has given a few particulars concerning them, insufficient, however, to enable the reader to come to an independent conclusion regarding the worth of this operation as compared with iridectomy. The number of operations was then 22, and included acute, chronic, primary, and secondary cases. "Experience teaches that care should be taken to divide the iris thoroughly, and that in order to carry out this object, the knife should not be too narrow. It is even permissible to ensure the section of the iris by a few backward and forward movements of the knife in its last position, just before withdrawal." The second scleriritomy, according to Nicati, has limited the value of iridectomy to cases of glaucoma with occlusion of the pupil.

Knies' Modified Iridectomy.

Knies in 1893 (18) reported having in two cases cut the base of the iris in making the incision. One case was annular posterior synechia, and the other primary acute glaucoma. Eserin should be used before the operation, and a Graefe knife should be employed. One should cut slowly, and may leave a bridge of sclera or conjunctiva. It is not very easy on account of possibly wounding the lens or zonule; "but the anterior chamber is shallow and at first—at least—the lens is not pushed forward to a corresponding extent." Priestley Smith says "advance of the iris depends on the position of the lens," this operation being therefore dangerous. Knies calls it *irido-sclerotomy*.

As has been said, Treacher Collins, in 1891, had already advocated the incision of the base of the iris with the object of opening up a new exit from the anterior chamber, in certain cases in which iris and cornea are adherent (19). The following, written by him at the same time, may advantageously be read in this connection: "If the root of the iris has become adherent to the cornea over the region of the ligamentum pectinatum, as so often is the case in chronic glaucoma, then, if an incision passes across the ligamentum pectinatum, the iris must necessarily be wounded; and if the root, as is not unusual, is atrophied as well as adherent, it would be almost impossible to wound it without penetrating it. That, in iridectomy, incisions situated internal to the commencement of the ligamentum pectinatum, and made with either a Graefe's knife or a keratome, divide the root of the iris is shown by (certain) cases, in both of which there was a wound in the lens capsule, opposite the incision in the sclero-corneal tissue. If, in making a sclerotomy incision, the knife passes into the posterior chamber opposite the ligamentum pectinatum, there is less likelihood of its wounding the lens than if it enter less peripherally, for the anterior of the ciliary processes are immediately behind the iris in this region and serve to protect the lens. Moreover, the lens does not extend as far outward as the commencement of the ligamentum pectinatum."

Vincentiis' Operation.

The following operation had been employed by Vincentiis (20) in various forms of glaucoma more than 70 times, and by his assistants 10 times. He says: "I propose to execute simple separation of iris from cornea at the angle of the anterior chamber by the aid of an instrument whose use is limited to the unplaiting of tissue, or to disengagement or even tearing at the iritic angle. What I can assert is that I have performed the said operation 4 times in absolute glaucoma, and 4 times I have obtained a result truly marvellous, because, without any irritative symptom having ever shown itself, except a slight injection of the episcleral tissues, as one observes it after the incision of the tissue of the iritic angle, the ocular tension has fallen at the end of 24 hours to the normal state, and there remained during more than the week during which the patient continued under our observation. The instrument with which I have practised this disengagement of the angle of the anterior chamber is analogous to that with which I make the incision of the iritic angle,* as well regarding the size of the blade, which is proportionate to its cutting end, as the slightly oval form of that end." It somewhat resembles a small crochet needle, blunt at its convexity and sharp at the end of its concavity. It is so made that "when the instrument has penetrated through the sclera 1.5 m.m. from the corneo-scleral border and has entered the anterior chamber from whatever direction one reaches with it the iritic angle, with the point in front, or behind which is preferable, it will always be the convex part which will find itself in contact with the iritic angle." The pressure on the angle draws away the pupil to that side and indicates the amount of force employed. Vincentiis believes that iridectomy will remain the operation in acute glaucoma, for by it one can obtain the most extensive modifications in the tissue of the iritic angle, which, on account of the corneal opacity and of the narrowing of the anterior chamber, can be directly produced by neither the incision of the tissue of the iritic angle nor by sclerotomy.

To diminish high tension Vincentiis would place in the first rank iredectomy, then incision of the iritic angle, and then sclerotomy. He would put his operation in the place of sclerotomy wherever the latter is now used, for, besides its better results, it shows a greater regard for the ocular tissues, the permanent integrity of the anterior chamber, and the absence of all immediate alteration in the equilibrium of the ocular tension, with all the useful results which flow from that.

Extraction of the Lens.

MacKenzie (21) found that extraction of the lens was sometimes of use, but he did not recommend it for general adoption, because he had seen such violent inflammation follow.

Rheindorf (22) wrote a paper advising this operation in malignant glaucoma, and added an incision into the "vitreous depression:" he also advised its adoption in cases where iridectomy and sclerotomy had had no good results, as well as in absolute cases in place of enucleation. In reply to the criticism that one cannot remove the lens in glaucoma with benefit to vision, he replied that the prospects for the eye are improved by this procedure, (A) when after iridectomy the anterior chamber is not reformed, *(a)* in acute cases relatively soon after, and *(b)* in chronic inflammatory and simple cases when the vision falls in the course of a few days; (B) when after iridectomy the anterior chamber reforms, but the vision further decreases; *(C)* in absolute glaucoma instead of enucleation. In 40 operations he had never seen intra-ocular hæmorrhage. On this subject Nettleship (23), who considered malignant glaucoma to be sometimes due to a weak suspensory ligament allowing the lens to become dislocated forward, thought that if it were not that in these cases the vessels are also generally so unsound as to be liable to rupture, the best treatment would be extraction of the lens in its capsule, and even with that risk it might sometimes be a good operation. From the importance which Priestley Smith has attached to the lens in the pathology of glaucoma one would expect him to advocate its removal in the capsule in certain cases, but he says (24), "the practical surgeon would shrink from attempting an extraction under such circumstances. The lens being healthy and sometimes disproportionately large, would demand a larger incision than is required for the cataractous lenses which we commonly extract, and it would separate from its attachments with greater difficulty."

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*A diagram of this is given by Vincentiis' first assistant, Ugo Tailor, on page 4 of his paper "Sulla Incisione dell 'Angulo Irideo," Napoli. Tipografia Angelo Trani, Strada Medina, 25, 1891.

When the lens has to be removed on account of cataract, there being reason to believe that there is a sufficiently healthy condition of the fundus, it is probably best to reduce tension first by an iridectomy and extract some weeks later.

Intra-Ocular Myotomy or Hypo-scleral Cyclotomy.

This operation was performed on the supposition that cramp of the ciliary muscle caused a stasis in the intra-ocular blood circulation. It was employed by Hancock in 1860, Heiberg in 1862, Pritchard in 1871, and Ortowski in 1872 (25). Hancock inserted Beer's knife at the outer lower scleral border and passed it down and back till the sclera showed a 3 m. m. section; or, after inserting it at the limbus and through the angle of the anterior chamber the muscle was cut "with the lens on one side and the sclera on the other side of the knife" (26). Autopsies showed that many of these incisions had divided a part only of the muscle.

Ciliary Punctures.

The object being not the division of the muscle, but rather to open the aqueous and vitreous chamber at the same time, have occasionally been employed with more or less success. Their action on tension, unless by the possible displacemont of the iris in recent cases, or by the dangerous inclusion of iris and ciliary process in the wound, must be less lasting than that of iridectomy, and for these reasons it is not an operation to be recommended.

Excision of the Nasal Nerves.

On the ground of Donders' hypothesis, that glaucoma is due to a neurosis affecting secretion, Badal and Lagrange (27) stretched and excised the infra-trochlear branch of the fifth nerve, and asserted that the results were reduction of pain and tension, with improvement, even in cases in which iridectomy and sclerotomy had been of no service. The practice, however, seems to have fallen, as might be expected, into complete disuetude.

Enucleation, Evisceration, and Optico-Ciliary Neurotomy or Neurectomy.

Instead of removing the globe in cases where the eye is both blind and painful, the surgeon sometimes prefers to eviscerate, by removing the cornea and then cleaning out the entire contents of the sclera, which is left free of any signs of uvea. An artificial glass or silver vitreous (Mule) is sometimes placed within the sclera before it is sewn up. Or, the globe having been removed, the ball has sometimes been sewn up in Tenon's capsule. All of these operations are superior to enucleation, so far as a movable foundation for an artificial eye is concerned, but the former cause a more prolonged and painful convalescence. From cosmetic considerations, optico-ciliary neurotomy or neurectomy, sometimes replaces enucleation. The conjunctiva having been divided over the internal or external rectus, the muscle is seized and divided a few m.m. from the globe, after having been secured on the distal side of the point of section by needle and thread. The optic nerve is then divided as far from the globe as possible, the eyeball is rotated so that the remains of the nerve and all the tissue on its posterior surface may be cut down close to the sclera. The eye is then replaced and the muscles sutured. This operation does not always prevent the return of pain in glaucomatous eyes. In two eyes, each removed for pain, two years after optico-ciliary neurotomy, Treacher Collins (28) found extreme atrophy of the uveal tract and retina, but less marked in front of, than behind, the equator. The lenses were clear.

An eminent London ophthalmic surgeon has informed me that he has in several cases of blind glaucomatous eyes *scraped back all the iris*, and even the ciliary body, from proximity to the cornea, and left them, with the result that the tension has fallen to normal and the pain has disappeared.

It is erroneously held by some surgeons that a glaucomatous eye cannot give rise to sympathetic ophthalmia, because the channels at the back of the eye are closed. Even if that were true, conditions may be altered when the tension has become normal after operation, and sympathetic ophthalmia is not unknown in glaucomatous eyes, even after optico-ciliary neurectomy and evisceration (29).

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MULES' OPERATION FOR ARTIFICIAL EYE.*

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MINNEAPOLIS.

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The cosmetic effect following ordinary eyeball enucleations with subsequent artificial shell insertions is unquestionably bad. Amongst the obscure laboring classes such mutilations may possibly be endured with equanimity, but with those whose existence is passed among higher business and social avenues, personal appearance cannot be ignored.

The employer seeking office assistance, will prefer a man with two normal visual organs, rather than an individual possessing a hollow socket, imperfectly filled by an immovable glass eye.

Young men with a fixed and implacable stare, emanating from an artificial shell, will find the pathway to matrimony considerably obstructed, as modern women object to such uncompromising observation, and would not relish the scrutiny of that calm, stony eye from across the table, while the other is perhaps bent upon an analysis of the soup. She would consider that a mean advantage had been taken if her husband always had an eye to spare, as it were, with which to watch her little peccadillas, and although the glassy character of *one* of them might be well understood, she could not always remember which one it was thus producing an unpleasant sensation of constant surveillance. The marital aspirations of the glassed-eyed young man must, therefore, be curbed, unless perchance his affections can be concentrated upon a damsel with a cork leg, hirsution countenance, or other pathological accomplishment, inducing a humble and servile disposition with limited matrimonial expectations, who, having perhaps arrived at discretionary years, sees in him her fading hope, and would eagerly seal the contract were he glass-eyed, red-headed and knock-kneed.

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*Read by title at the Western Ophthalmological, Otological, Laryngological and Rhinological Association, held at St. Louis, April 6th, 1897.

The young lady also finds that in spite of otherwise exceptional physical and mental charms, her wares are placed upon a falling market if she be handicapped by a removable eye. Her husband's feelings will suffer much disquietude in seeing that lustrous orb, into which he has gazed so many times with admiration and emotion, reposing with nocturnal regularity in a tumbler of water. Decidedly, then, the loss of an eyeball is a most unfortunate episode in one's life, and it becomes us as modern ophthalmological surgeons to mitigate its severity and lighten its burden as much as possible, and it shall be the object of this paper to cordially endorse a procedure taking many steps in the right direction.

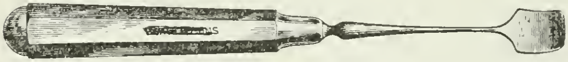
The absolute and uncompromising enucleation or extirpation operation is still employed by most surgeons. In this procedure, the entire eyeball is ruthlessly obliterated, and its motor functions destroyed. leaving only a great hollow space to mark the site of devastation. Into this socket an artificial shell is subsequently inserted which, being in contact with no supporting or abutting surfaces except the lids and orbital floor, naturally sinks from prominence, but becomes conspicuous from its immobility, staring. expressionless appearance, and the deep characteristic sulcus just under the orbital ridge.

The retraction of the artificial shell into the ample socket prevents apposition between it and the canaliculi, which is essential to proper lachrymal drainage by capillary attraction, thus inducing a repulsive overflow of tears, an excoriated cheek, and the frequent use of the handkerchief. In short, the insertion of an artificial eye after complete enucleation, rarely more than mitigates the personal appearance and in case better results are apparent, inspection will usually reveal an atrophied globe partially filling the socket. Evisceration was proposed for cosmetical purposes, and the little nubular stump *does* enhance the protuberance and mobility of the shell, in spite of the unnatural position and adhesive condition of the motor muscles; but the frequent occurrence of sympathetic ophthalmia and dangerous reaction has caused the operation to be abandoned by most surgeons.

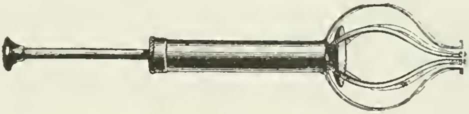
It is in view of the repulsive deformity following enucleation and the but slightly improved personal appearance following eviseration, together with its unfortunate statistics, that has induced me to overcome a prejudice and experiment with the operation devised some years ago by Mr. Mules of England. This operation fell into disrepute after a short probationary period, owing to a natural disinclination to the retention of a foreign body in the scleral cavity, the frequent occurrence of severe reaction and the occasional ejection of the glass ball from excessive size, or imperfect suturing. These objections have largely disappeared, however, with added experience and thorough asepsis, and I am confident that a fair trial will establish its value.

The strictest aseptic precautions have been maintained in all my operations which is, of course. more than usually necessary, and I have been assisted by my associate, Dr. Frank C. Todd. The details of the operation are as follows:

MULES' GLOBES.



INSTRUMENT FOR SCRAPING THE INTERIOR OF THE GLOBE.



IESTRUMENT FOR HANDLING MULES' GLASS GLOBES.

First, the ocular conjunctiva is freed from the sclera, from the cornea toward the equator of the eyeball. The cornea is removed with knife and scissors, contents of the globe scooped out, great pains being taken to thoroughly scrape the sclera, that no choroidal or uveal remnants remain to serve as a focus for subsequent irritation. The optic papilla is also scraped down to a level with the surrounding sclera in order to do away with the danger of irritation by pressure of the glass globe upon the delicate nerve fibers. The slightly elevated scleral border of the sclerocorneal junction should be smoothed off, when the opening may now be enlarged vertically, and the edges so trimmed that they will come together nicely after the sphere has been inserted.

The next step is to stop the hemorrhage, and this I consider of importance, although I noted that Buller of Montreal paid to it but little attention. This is accomplished by hot bichloride tampons inserted into the scleral sac. After hemorrhage has ceased the sclera is carefully inspected, to ascertain if it is perfectly clean, when iodoform tampons are placed in the cavity once or twice, after which the scleral surface will be smooth and dry and ready for the insertion of a Mules' hollow glass globe.

Several small globes of varying sizes and made aseptic should be ready for use, and from these one is selected which will fill out the orbit and be of sufficient size to communicate motion to the artificial eye to be subsequently used, but small enough to allow for the inevitable inflammation, swelling and shrinkage, which will surely follow.

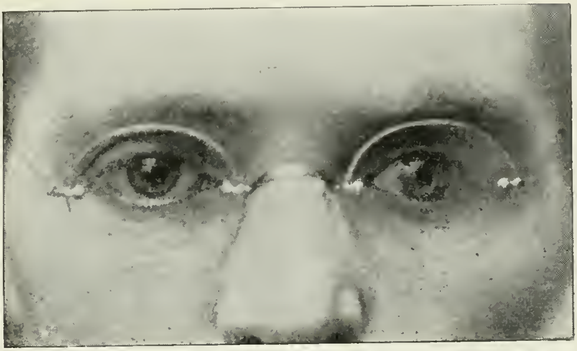
The sclera is now brought together vertically over the glass globe with five or six sutures of catgut or silk, which are allowed to permanently remain. The conjuctiva is then sutured horizontally, which sutures are either removed in about a week or allowed to come out of themselves. A dressing of iodoform and cotton kept saturated with an aseptic, antiphlogistic lotion recommended by L. Webster Fox, of Philadelphia, consisting chiefly of lead, opium and arnica, is then applied, and the patient required to rest quietly in bed. Both eyes should be bandaged. The reaction following is sometimes enormous, but persistence in the use of the lotion, which may be iced if the swelling is severe, will in from one to two weeks bring about a favorable result.

The formula for the lotion which I have used and found efficient, is as follows:

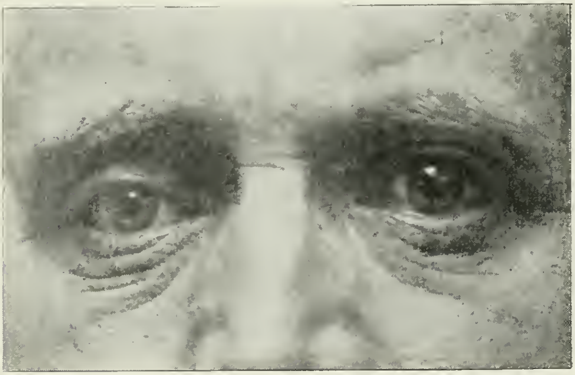
R	Tr. Opii.	
	Tr. Arnica.	
	Tr. Belladonna ää	ʒ ii
	Aqua camphor	ʒ i.
	Aqua plumbi	ʒ vi.
M.	Aqua destill. ad. q. s.	ʒ iv.

Mr. Mules' instrument for catching the glass globe and inserting it within the scleral sac is useful, but not essential, as one's fingers answer the purpose. The same may be said of the shovel-shaped curette for intra-scleral scraping, as the same procedure can be efficiently accomplished by almost any good sized curette.

In about a month an arttficial shell may be fitted, and the cases before you illustrate the superiority of the Mules operation over any other.



MRS. K. TUBERCULAR IRITIS. LEFT EYE REMOVED.



MR. J. SUPPURATIVE IRITIS. RIGHT EYE REMOVED.

The appearance is natural; the eye has expression and good motion; the orbital cavity is well filled out, and the annoying and repulsive lachrymation noticed after other operations is not present, owing to the juxtaposition of the artificial eyeball and the puncta.

I would not hesitate to use this method in a suppurating case, and consider it a great and humane advance in ophthalmic surgery.

602 Nicollet ave.

THE TARSAL FORM OF SPRING CATARRH. A CLINICAL, ANATOMICAL, PATHOLOGICAL AND THERAPEUTICAL STUDY.

By Dr. Darier, of Paris.

TRANSLATED BY DR. R. A. MACARTHUR, OF CHICAGO.

I.

Historical.—In the classichl treatise of v. Graefe and Saemisch, in which spring catarrh is for the first time described by Saemisch himself, no mention is made of the changes that take place in the tarsal conjunctiva.

Raymond de Furin was the first to draw attention to the complications of spring catarrh, but it is Horner, especially, who has studied with the greatest care those which affect the palpebral conjunctiva. He pointed out that in almost all cases of spring catarrh, characterized by pericorneal changes (9 cases out of 10), there is found a papillary hypertrophy of the conjunctiva of the upper lid.

Following him, many authors have described the "tarsal" form of spring catarrh, and yet it is very imperfectly known and is constantly being confounded with "conjunctivitis granulosa," especially those cases in which there is a complete absence of peri-corneal changes. These cases are not so rare as is believed, and for my part I can say that if the "peri-corneal" form is rarely met without some papillary hypertrophy of the conjunctiva, the opposite is not true, and the "tarsal" form is frequently seen without any peri-corneal nodules.

It is to this exclusively tarsal form of the disease that it is necessary to direct the attention of the ophthalmological world on account of the errors in diagnosis that are being committed daily. I have not yet had a case of this kind that has not been taken for a trachoma by several competent confréres.

Recently H. Gradle,* of Chicago, has also called attentention to the same fact. He reports 12 cases in which

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*"The Palpebral Form of Spring Catarrh." *Archives of Ophthalmology*, XXIV.

only 1 presented very small peri-corneal nodules. Almost all these cases had been diagnosed as trachoma by the majority of ophthalmic surgeons who had been previously consulted. Two years before I knew of the works of Horner and Raymond I had pointed out the difference that obtains between the granulations of trachoma and the changes that occur in the tarsal conjunctiva in spring catarrh. In the acute stage of trachoma the granulations are characterized more by their contents, which are seen, as it were, by their transparency, than by their papillary hypertrophy; they become solid and hard only by subsequent hypertrophy of the connective tissue, which only supervenes slowly, while from its commencement the tarsal form of spring catarrh is characterized by a dense and hard papillomatous hypertrophy, which never shows even the slightest or smallest center of softening or breaking down.

A single point only of resemblance could exist between these two affections; that is, they both appear to be due to a specific infection. Unfortunately the researches which I have undertaken, or had made for me, to discover the micro-organism have yielded no more result than those undertaken in trachoma. The histological examination undertaken by the authors occupied in this reseach has not succeeded in convincing the partisans of that view of the identity of the two affections. Having had an opportunity lately of seeing an extremely well marked case of spring catarrh, I excised nearly all the diseased spots, and have asked H. Villard, of Montpelier, to make a microscopical examination of them for me, No one, after his remarkable investigations upon strabismus, is better qualified to make a differential diagnosis between the two diseases by a microscopical examination. The result of his careful investigations has fully justified our foresight. For the rest, we publish in extenso the note which he had the goodness to send us, and thank him here for it sincerely.

II.

A confrére in the province in August, 1896, sent me a patient with the diagnosis reached by him and four other oculists of "conjunctivitis granulosa," which yielded to none of the usual methods of treatment—silver nitrate, copper sulphate, and even expression and grattage. I had hardly everted the upper lid when I recognized the so-called trachoma as a most typical and characteristic case of the tarsal variety of spring catarrh. I understood then why treatment by active caustics had produced no favorable result; perhaps the therapeusis adopted had caused an exaggeration in the development of the conjunctival papillæ. The condition of the patient was as follows:

L. Abbé, C: robust: no evidences of tuberculosis or syphilis: of nervous temperament: the eyes, which usually were widely open, are today half closed. The upper lid dropped almost to the middle of the papillary space. The lashes are not at all misdirected. The lid is thickened, heavy, and as if formed of two layers of lardaceous semi-transparent tissues—so that one would think at first that the lid did not touch the surface of the cornea. The eye weeps a little, is bright, slightly intolerant of the light, and with a slight hyperæmia of a dull red color, quite different from that which we see in trachoma. It would seem as if the bulbar conjunctiva had been smeared with oil. The cornea presents no changes. There is a slight peri-corneal hyperæmia, slightly more marked in the horizontal diameter. At the inner canthus, near the succulent and lardaceous caruncle, is a muco-purulent collection, which the tears wash out with long filaments. On eversion of the upper lid the whole tarsal surface is exposed, the appearance of which is so characteristic that any hesitation is impossible. If the diagnosis of trachoma has been reached previously it cannot be maintained today.

This surface smooth, shining, almost gelatinous, which increases uniformly the thickness of the tarsal cartilage and which ceases abruptly at its edges, presents only a very feeble resemblance to the irregular, papillomatous, granular surface of a trachomatous conjunctiva. And what is of prime importance, the mucous membrane of the fornices presents no changes: it is rarely ever thickened and roughened, while the site of election for the granulations is *par excellance*, the bottom of the former. By its situation alone one could say that the tarsal cartilage is the exclusive site of the pathological process. In fact, if the diseased tissue is incised the sensation of cutting through a dense, hard and cartilaginous tissue is felt. Quite different is the sensation produced by an incision into a trachomatous tissue, in which are felt points with softened contents between fibrous bands.

What confounds this form of spring catarrh with trachoma is the split and cracked appearance which gives the impression that the large number of granulations compressed by and crowded against each other have been able to stamp upon the morbid process a special form as we see it in the appearance at this point.

In a case which has had a variety of treatment, surgical and otherwise, it is impossible to adopt any treatment that will bring about a cure, except after a considerable lapse of time.

Mons. C. could only arrange for a month's vacation; I therefore decided upon the total removal of the diseased tissue. The pain occasioned by the first attempts at removal without cocain only allowed small strips of the tissue to be moved. The patient was then chloroformed, and with a long scalpel I made a series of shavings parallel to the surface of the conjunctiva until I felt I had come down upon the healthy cartilage. This was easily recognized at first by the thinness of the remaining tissue, and then by the fact that all the glands could be seen through the transparent tissue.

The hemorrhage was quited insignificant, as compared with what occurs in similar treatment of trachoma. The upper more than the lower lids were thus freed of all hypertrophied tissue. At the end of a few days a new conjunctiva had formed. A stringy muco-purulent discharge persisted during the entire stay of the patient in Paris.

At his departure Mons. C. was delighted with the result. He opened his eyes widely without experiencing that sensation of heaviness which formerly prevented his so doing. He no longer had those itching and burning sensations which tormented him day and night. Applications of nitrate of silver and acetate of lead removed the secretion. From the end of the month of September, when the patient ceased attending my clinic, to the 15th of March, the cure remained perfect, and the news which I have just had tell me that all irritation has disappeared, the secretion has not returned, and the examination made by one of my confréres discloses the fact that the pathological process had not returned, notwithstanding that spring is already well advanced.

III.

The treatment of spring catarrh in the light of my own experience may be summed up as follows:

Soothing remedies, bathing with water, or water in which carbolic acid or creolin has been dissolved. By this means is obtained the most rapid and marked relief. These may be employed three or four times a day.

Speaking generally, applications of nitrate of silver or sulphate of copper are not indicated, and do good only when the stringy, muco-purulent secretion (almost pathognomonic of spring catarrh,) is pretty abundant. In the peri-corneal form of spring catarrh I have tried all the methods and remedies recommended by other authors, none of which have given, in my hands, any appreciable result. I do not believe I am going too far when I say that the best treatment is massage of the cornea with mercurial ointment, made up with lanolin (Ungt. Hydrarg. Lan.), which I have already described,* and the efficacy of which has not failed in a single instance among all the cases of the peri-corneal variety of spring catarrh which I have treated. It is true that after three weeks' or a month's daily massage of the cornea with the ointment, the characteristic peri-corneal circular swelling does not entirely disappear; but no other treatment has given me results equal to or as favorable as this.

It is quite different in the case of the tarsal form of spring catarrh, which is not, as it were, affected by massage with this ointment. From this it might be said that the two affections are not of the same nature, but I do not believe this: it is much more likely that the nature of the tissue in which the disease is situated causes the difference in the results of the treatment.

In those comparatively recent cases in which the papillary hypertrophy is not excessive, I have always found scarification, with the lines of incision close together and crossed, of very considerable service. Those scarifications are repeated every four days for several weeks. After scarification the more exuberant papillæ may be removed with the curette. This treatment brings about a relative cure in two months, but it may be necessary to repeat this treatment for two or three springs.

Where the case is as aggravated as the one which has just been described, the total removal of the diseased tissue will be found necessary to complete the cure inaugurated by the remedies, or by the scarifications if these have done.

This is all I have to say about the treatment of spring catarrh until the discovery of the specific infectious material shall have furnished us with more definite indications for treatment.

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*Bulletin of the Ophthalmological Society of Paris, 1888-89; and also Dudley Fait Thesis, of Paris, 1889—"Study on Lanolin."

IV.

Microscopical examination of a case of spring catarrh, made by Dr. H. Villard, of Montpelier:

The tissue sent me by Dr. Darier, of Paris, for histological examination consisted of four small white, flat, non-shrunken pieces with a granular and irregular surface, hard and stiff, about 5 or 6 mm. in diameter and 2 or 3 mm. in thickness. These pieces, taken from the conjunctiva over the tarsus, had been hardened and preserved in 95 per cent. alcohol. Three of these pieces were imbedded in parafin and cut by the ordinary microtome, while the fourth had been imbedded in gum and cut by the hard microtome. All the sections were stained with hæmotoxylin and eosin.

The epithelium was intact along the greater extent of all the preparations; it was absent only at some points, but this was of no importance, since it was the result of the obtaining, handling or preparing the specimen.

The epithelium is thickened, and belongs to the stratified pavement variety: the deep cells are polygonal, the superficial ones flattened and lamellar. The epithelial layer has, therefore, changed its character, since the epithelium of the tarsal region, whence came the specimens under examination, belongs to the cylindrical shaped variety. A similar modification of the epithelium is also found on the surface of the less prominent granulations in trachoma (H. Villard, Pathological Anatomy of Conjunctivitis Granulosa. Thesis of Montpelier, 1896, p. 102 and fig. 7.) and in the conjunctiva of cases of cured trachoma (p. 131, fig. 13).

In the epithelium thus transformed are found some rare cells, containing mucus, like those seen in the epithelium which covers the granulations; sometimes they are not so numerous as in trachoma. As a result of the two characteristics which I have just pointed out (the pavement variety of epithelial cells and the mucous cells) the conjunctiva of spring catarrh bears a resemblance to that of the normal eye (Ibid, p. 82-93).

The preparations which I have examined present in addition, and for the most part, very deep furrows, much deeper in general than those frequently seen in trachoma, and give to some of these a slight appearance of lobulation. These furrows are covered by an epithelium which differs ordinarily from that just described; it belongs to the cylindrical variety, and contains rather more mucous cells. There is thus a tendency toward the formation of the same tissue as in the glands of Ivanoff, but it is merely a resemblance, and differs totally from the so-called glands of Ivanoff which are met with in trachoma.

The epithelium, the pavement of the surface, as well as the cylindrical of the furrows, is invaded by migratory leucocytes. These leucocytes, sometimes single, sometimes in small masses, constitute true nests intra. A similar but less pronounced condition is found in trachoma (p. 103, figures 11 and 13).

Relatively abundant hemorrhages are found at the surface; sometimes the extravasation of blood is at the surface, and nearly detaches the superficial layers of cells. These hemorrhages, therefore, are quite different from those at times found in trachoma, since the latter are below the epithelium, which they lift up and detach, and which often precede those follicular changes first described by Raehlmann (p. 129).

To sum up: In spring catarrh the epithelium—

1. Changes its character and becomes stratified pavement, except in the furrows where it preserves its cylindrical character;
2. Contains mucous cells, especially numerous in the furrows;
3. Is invaded by migratory leucocytes.

All these characters closely identify it with the epithelium of trachoma, but it is a mere resemblance, and not a true identity of structure.

Below the epithelium we find a tissue which is dense and compact, and presents the following structure: It is formed of fibrous bands which are sometimes very thick and anastomose with each other, and form a large fibrous frame work analogous to the fibrous tissue of the tarsus, with which it seems to be continuous. Among the large bands are found finer fibrous fasciculi, which anastomose with each other. The outer spaces of this very well developed fibrous stroma are filled with numerous white corpuscles, presenting a strong resemblance to those white corpuscles with a single nucleus seen in granulations. These are, thesefore, large leucocytes, with a round or oval nucleus, which stain well with hæmotoxylin.

These leucocytes are never grouped in nodules; they are scattered everywhere, in the deep as well as in the superficial portions of the section. If in any one spot they form slightly more enlarged masses than in another, it follows that in that spot the fibrous stroma is less compact and dense and permits the accumulation of the leucocytes: but these accumulations are always irregular and non-encapsulated: what is more at the edge of these pseudo-nodules the leucocytes merge insensibly into those of the surrounding tissue.

These leucocytes with a single nucleus are not the only ones met with in the substance of the tissue of spring catarrh; in many places a considerable number of leucocytes,with several nuclei, is found in process of migration, as is indicated by their elongated form.

Vessels are rather rare in this fibrous tissue; some of them are filled with leucocytes. In some cases the nuclei of the endothelial cells of the vessel wall are swollen, which indicates very clearly their inflammatory nature. The leucocytes do not appear more numerous around the vessels than in other parts of the section.

In some sections are found culs-de-sac of the meibomian glands, and these are quite normal.

The tissue proper of spring catarrh is entirely different in its minute structure from that of trachoma: the principal differences which I have mentioned may be summed up under the following heads:

1. Leucocytic and diffuse infiltration; the masses of leucocytes do not form nodules which are clearly defined, easily distinguished from the surrounding tissue,and which are ordinarily enclosed in a connective tissue capsule, with very fine fibers, as is seen in trachoma.
2. The leucocytic infiltration has not the same situation as in tra-

choma. I have shown that the tarsal conjunctiva may be separated into two quite different layers; a superficial or mucous one. formed of delicate connective tissue, infiltrated with numerous leucocytes and a deep or fibrous layer formed of thick, dense bundles of connective tissue, so closely crowded as to scarcly permit infiltration by leucocytes (Ibid, p. 83-899 and fig. 6). I have also shown that the granulations develop exclusively in the superficial or mucous layer, never invade the deep or fibrous layer, into which they merely slightly dip down. Now, nothing like this is seen in spring catarrh; the leucocytic infiltracion far from being limited to the superficial or mucous layer, is generally found in both layers of the conjuctiva. It is a topographical distribution of prime importance which completely differentiates it from trachoma.

3. The fibrous tissue which forms the principal part of the tissue of spring catarrh is a tissue with thick, resisting bands, snd differs totally from the connective tissue, with generally thin and delicate bands, of trachoma.

In conclusion, the tissue of spring catarrh gives the impression of a diffuse inflammatory infiltration, having no tendency to the formation of circumscribed nodules, as in trachoma.

ABSTRACTS FROM RECENT GERMAN OPHTHALMIC LITERATURE.

Quarter Ending July 1st, 1897.

By H. V. Würdemann, M. D.,

OF

MILWAUKEE.

Nine Articles on Holocäin, the New Local Anesthetic.—Anatomy and Physiology of the Orbit.—Etiology of Myopia.—Relations Between the Eye and Ear.—Position of Lens During Accommodation. — Appliances for Lecture Purposes.—Arthritis Following Blennorrhœal Conjunctivits.—Hyperbolic Glasses.—Acquired Corneal Astigmatism.—Tuberculosis of Iris.—Follicular Disease of Eye.—Two Cases of Congenital Malformation.—Hysteria with Strabismus and Ptosis.—Suppression of Trachoma in Prussia.—Trachoma in Prussia.—Left-Sided Field Defect of Right Eye—Embolism of Central Retinal Arteries.—Detection of Foreign Bodies by X-Rays.—Distance of Retinal Veins Causing Recurring Hemorrhages in Adolescents.—Amarausis Due to Occipital Metastatic Absceses.—Action of Eye Muscles and Manifestations of Palsies.—Examination for Color-Blindness in Railroad Employes.—Gonorrhœal Conjunctivitis.—Eye Disease Treated by Insuffiation—400 Senile Cataract Operations.—Infectious Conjunctivitis.

Holocäin.

(A number of articles have appeared in the German medical press during the last quarter concerning this new local anesthetic, the principal of which the editor has here brought together.)

H. V. W.

p-Diathoxyathenyldiphenylamidin, a New Local Anesthetic.

Tauber, E. (*Centralbl. f. prakt. Augenhkde.*, February, 1897.) There is a short note by Hirschberg upon Tauber's experiments with holocäin in the January number of the *Centralblatt*, and several short articles upon the same drug in the February and March numbers by Tauber and others. The drug is technically termed amidin and holocäin by the makers. It is derivative of p-phenetidin, like phenacetin and lactophenin; is a strong base feebly soluble in cold water to quite 2½ per cent. of acid amidin; is soluble in alcohol and ether, and in hot water. It melts at 121 degrees (cent.); neutral reaction, and its efficacy not changed by heating, although when heated in glass vessels some free alkali is given off affecting glass, and thus should be heated in porcelain. The solutions are stable, 1 per cent. remaining clear for two months. It is a strong local, although poisonous, anesthetic.

H. V. W.

Experiments With the Local Anesthetic Holocäin.

KUTHE, R. (*Centralbl. f. prakt. Augenhkde.*, February, 1897), has used the new anesthetic extensively in Hirchberg's clinic, and reports upon its use in 45 eyes, from most of which foreign bodies had been painlessly removed. Anesthesia results 15 seconds after putting in two to three drops of a 1 per cent. solution, lasting 10 minutes, the usual sensation returning 2 or 3 minutes afterward. There is at first a slight smarting, no more than that from cocain, and a feeling of dryness and coolness. The epithelium of the cornea does not desiccate. It causes no appreciable change in the pupillary reaction, nor does it affect accommodation. The lid reflex is a little diminished. The usual appearances of cocain which are caused by slight irritation of the sympathetic, such as squeezing of the eyelids, hyperemia and anemia of the vessels did not follow from holocäin. The latter drug is readily absorbed, and is more applicable where there is decided chemosis of the conjunctiva, as in such cases cocain fails or its action is incomplete. In a case of corneal ulceration, with decided chemosis, satisfactory anesthesia was produced by holocäin, allowing of thorough cauterization of a corneal abscess, and at a subsequent operation the anterior chamber was opened, washed out with physiologic salt solution and pus evacuated. It is certain that the drug is more poisonous than cocain, although in clinical work no unpleasant result has been observed. Injected under the skin of animals it produces decided clonic spasms. H. V. W.

The Action of Holocäin.

HEINZ, R. (*Centralbl. f. prakt. Augenhkde.*, March, 1897.) When 1 per cent. to 5 per cent. solution of holocäin is dropped into the eye, light and transient redness of the conjunctiva and a slight burning sensation follows, somewhat like, but no greater than cocain. Full anesthesia of the conjunctiva and cornea begins in from 1 to 3 minutes. The weakest concentration when dropped in the eye for production of total anesthesia is the same as cocain, whereas eucain requires 5 per cent. Holocäin has no effect upon the action of the pupil, produces no contraction of the blood vessels and does not increase intra-ocular pressure, but seems rather to reduce it. It is a protoplasmic poison, 1 per cent. solution stopping the ameboid movement of the rhizopods and motions of the infusoria, as well as the cilia of the frog's throat. Germs and bacteria are hindered in their growth by $\frac{1}{10}$ per cent. solution. A 1 per cent. solution stops putrefaction and fermentation entirely. When amidin solutions become turbid, it is not due to growth of bacteria, but the setting free of a little alkali. Such solutions are not spoiled, but are again rendered clear by filtration. Boiling does not change its efficacy. Sterilization by heat is unnecessary, as a 1 per cent. solution is directly bactericidal. When injected under the skin of animals. clonic spasms like those of strychnin are produced. The fatal dose for frogs is from 2 to 3 mg. In warm-blooded animals cramps begin from 5 to 10 minutes after subcutaneous injection, with trismus and clonic contraction of the neck and ear muscles, which rapidly spread through the entire body, death resulting from tetany of the respiratory muscles. The respiration and the heart's action is accelerated. Comparison of the results of cocain, eucain and holocäin show that the smallest toxic dose of cocain is 0.05 g; for eucain, 0.75 g.; for holocäin, 0.01 g. Holocäin is thus an active poison, but this factor should not detract from its use in ocular practice. A 1 per cent. solution produces anesthesia of the eye without other symptoms. A large number of experiments with the 5 per cent. solution caused no intoxicating symptoms. H. V. W.

Holocäin, a New Anesthetic.

HEINZ, R., AND SCHLOSSER, C. *(Klin. Monbl. f. Augenhkde.*, April, 1897.) report upon four months' use of holocäin, their article being similar to those of Tauber. Kuthe and Heinz, published in the *Centralbt. f. prakt. Augenhkde.*, February and March. 1897, with the exception that they find for most cases, a $\frac{5}{10}$ per cent. to $\frac{8}{10}$ per cent. solution is sufficient to produce complete anesthesia, although some persons require 1 per cent.

Holocäin is said to have the following advantages over cocain: 1. Its antiseptic qualities, the solution never needing to be sterilized. 2. Its quick action and the lessened danger of corneal maceration, and is a good medicine to drop in the eye before using painful or irritant remedies. 3. There are no after effects. A 1 per cent. solution is recommended to be dropped in the eye and repeated in one-half minute, and in one to one-half minutes afterward, the work may be begun. H. V. W.

Holocäin, a New Anesthetic.

GUTMANN, (*Deut. Med. Woch.*, No. 11, March 11, 1897.) reports results achieved with the use of Tauber's new anesthetic; of a 1 per cent. solution, 3 to 5 drops are used. Such an instillation gives complete anesthesia in 1 minute, lasting on an average, 10 minutes. Operations for removal of foreign bodies, galvano-cautery work, tattooing of cornea, tenotomy and discissions, are painlessly done. Pupil, ocular tension and accommodation remain unchanged, and cornea remains moist throughout. No toxic results have been seen when used by instillation, though hypodermic use showed toxicity in rabbits. In sterilizing, the solution must be boiled in vessels entirely free from alkali, and for this purpose porcelain vessels are used. Its advantages over cocain are, however, seen to be numerous and important. H. V. W.

Holocäin.

GUTMANN. (*Deut. Med. Woch.*, No. 11, March 11, 1897,) relates his clinical investigation with this new anesthetic, which is closely allied to phenacetin. The chloride crystalizes in white needles; soluble in hot water, sparingly in cold. If heated with water in glass vessel solution is often cloudy, due to small amount of alkali present, hence, a porcelain vessel should be used. Author first records his experience upon rabbits. He used it in 30 cases in men, 13 of which were foreign bodies in the eye; 2, keratitis; 7 operations on eye; 8 cases of healthy eyes. One minute following introduction of 3 to 5 drops of 1 per cent. solution, there was anesthesia of cornea. A passing, burning sensation was felt. Foreign bodies were removed without inconvenience, and cautery was used in case of corneal ulcer. Two cases of leucoma were tattooed. Tenotomy of the eye muscles was compared in one case under cocain and holocäin, resulting in favor of the latter. Anesthesia lasts from 5 to 15 minutes under holocäin, ocular tension not diminished, cornea remaining moist and shining; pupil unaltered and accommodation unaffected. In a patient 40 years of age, 3 drops of 2 per cent. solution of cocain instilled into the eye, anesthesia in 2½ minutes. lasting 3¼ minutes, pupil dilated, tension diminished. With 3 drops of 1 per cent. solution of holocäin instilled in the eye, anesthesia after slight sensation of burning 1 minute, and lasting 9 minutes. No alteration in appearance, pupil not dilated. The advantages of holocäin are, rapidity of anesthesia, non-dilation of pupil, lessened pressure (useful at operations for glaucoma, but drawback in cataract extraction). Holocäin should not be used hypodermically, as symptoms of intoxication were rapidly produced by a small dose in a rabbit. For external use, he recommends it as a valuable substitute for cocain. H. V. W.

Holocäin.

HIRSCHFELD, (*Klin. Mon. f. Augenhkde.*, May, 1897.) has a short article of personal experience, in which he corroborates findings of other writers regarding the new anesthetic, observing no poisonous symptoms, and states that in deeper operations, such as tenotomy and advancements, it possesses no advantages over cocain. H. V. W.

Hydro-Chlorate of Holocäin.

LOEWENSTAMM, (*Therap. Monats.*, May, 1897,) relates further investigations of the use of holocäin, 1 per cent. watery solution in ophthalmic practice, which are similar to those of the other reviews given in this number. He remarks, that holocäin is less readily absorbed from the conjunctiva than cocain, and that it is a prompt, pronounced, and long-lasting anesthetic, having no unpleasant results. H. V. W.

Notes Upon the Anatomy and Physiology of the Orbit.

KOENIGSTEIN, L., Wein. (*Beitrage z. Augenhkde.*, XXV. Heft., Dec. 10, 1896,) treats in 49 pages of the anatomic and physiologic relations of the orbit. The description is good, but the article has no illustrations, a striking defect in a work of such character. Tables showing the principal dimensions of the orbit from fetal life to 98 years of age, are given. The measurements increase to the 18th or 20th year, when full growth is reached; after 85 years senile involution begins, and contraction takes place. Its dimensions are changed by pathological lesions, by ossification of the sutures, or by forces acting during childhood. Tables and dimensions of various forms and skulls are given. The relation of the orbit to the cranial cavity, sinuses and fossæ of the skull, are shown.

The capsule of Tenon should be understood to include: 1. The entire frame work of the orbit with the periosteum, *i. e.*, peri-orbital fascia, and is described as the aponeurosis orbito-ocularis. 2. The entire connective tissue with the exception of the peri-orbital, besides the fascia tarso-orbitalis. 3. All the ramifications of connective tissue which accompany the muscles to their insertion, such as the posterior half of the outer layer of Tenon's fascia, and its continuance to the cornea and the thin lamella which covers the entire posterior part of the bulb, the deep layer. 4. Tenon's fascia, properly so-called, should be considered (as Montais has describod it) to be that thin membrane which overlies the posterior portion of the bulb, covers the muscular insertions and forms the bursæ serosæ. The relations and movements of the muscles of the eyeball and orbit are duly described, as well as results of tenotomies of the muscles, incision into Tenon's capsule, and the various forms of advancement. The efficacy of de Wecker's procedure of capsular advancement is shown to be due to folding of the tendon. The septum orbitale, the lid folds and the form of the tarsus, are shortly described.

H. V. W.

The Etiology of Myopia.

WEINLAND, E. F. (*Beitrage z. Augenhlkde.*, Heft. XXVI., April 6, 1897.) Authors have hitherto considered that myopia was caused by forces external to the bulb, such as pressure from the muscles (Stilling et. al.) or the retraction from a short optic nerve, or to forces acting from the inside of the eye, such as a slight increase of the intraocular pressure through over activity of accommodation. He places these considerations in the back ground, believing that there is a diseased process, taking the form of sclerotico-choroiditis-posterior. Ascher could not produce changes in the refraction through very strong convergence of eyes in rabbits, or through increased accommodation by the use of eserin, although kept up for many months. Other observers had been unable to produce myopic conus by either external or internal pressure, or force upon the bulb. It is thus shown that the formation of conus is likewise not due to tearing of the choroid. Schnabel and Hernheiser also point out another objection to intra-ocular pressure producing myopic conus, as it is not found in the greatly injured eyes of congenital glaucoma, in which the choroid is certainly greatly stretched. Another objection is, that the staphyloma is formed only at one side of the papilla. S. and H. have considered that conus is due to congenital weakness in both of the outer coats of the eye. The insertion of the optic nerve bears a relation to the development of myopia. There may be congenital disposition, but W. considers other certain working causes which are not identical. S. and H. have shown that in conus the lamina vitrea is the farthest away from the papilla, the underlying portions of the choroid are more commonly less, and the sclera still less drawn away from papilla. The lamina vitrea is the most affected and, as a rule, the retina remains intact. The resistance of the sclera itself is diminished, either all around the optic nerve or laterally, as a rule, in an elliptical area, the long axis of the ellipse reaching from the posterior end of the tendon of the inferior oblique to 1 or 2 mm. from the optic nerve. Staphyloma always arises in this place. This zone is not sharply defined, but is abnormally irregular, which speaks for a local cause.

The myopic changes are macroscopically visible only when the process has reached a considerable extent. In low grades of myopia, small changes are not so clearly seen, but the same forces are acting as in the higher grades, which are the lessened resistance of the sclera and the formation of conus. It is certain that the effect of light upon the macular region has something to do with myopia. W. shows that the straining of the accommodation can have very little effect upon lengthening of the bulb. The ectasia is not produced by the pulling of the optic nerve upon the sclera or choroid. If such were the case, the bulging would be concentric around the optic entrance, and not eccentric. Rabbits blinded by electric light, heat rays being excluded, show changes similar to those in myopia: 1st, edema of the retina in which the rods and cones are affected; the pigment less affected. When the destruction is less the retina is changed into a sponge-like tissue with wandering pigment cells. The whole process passes over without any reaction in the surrounding parts of the retina, but in many cases near the blinded area, swelling and infiltration of the choroid appeared, which was followed by thinning of this membrane. W. notes that high grades of myopia show changes in the retina and choroid, in the region of the macula lutea of the same kind as those produced by experimentally blinded eyes of animals, as well as that which is seen in acute essential hemeralopia in men, in sun blindness and in the chorio-retinitis, produced by use of the telescope and microscope. For this reason, he thinks that the original cause of myopia is due to the effect of light. He shows that many myopes are photophobic, that albinotic eyes commonly become myopic, and that pigment degeneration is observed in most cases of high myopia. He thinks that there is a general weakening of the tissues from poor nutrition, due to the lessened metabolism and consequent diminishment of the scleral resistence. Through this the central part of the eye ground (corresponding roughly to an oval between the attachment of the inferior oblique muscles and the optic nerve entrance) and the sclera is thinned, and is pushed backward, forming posterior staphyloma. H. V. W.

The Relations Between Eye and Ear.

OSTMANN. (*Archiv. f. Ophthal.*, Band XLII., Abth. 1, 1897.) Since the brochure of Moos in 1878, the literature of relation of eye and ear has been enriched by a number of articles, which have been collated by O. The eye is much more commonly affected from ear disease, than the ear is from the organ of vision. This is the reason that the attention of the ophthalmologist is less often brought to the physiologic and pathologic relation of these organs. The symptoms are developed either directly from the outer, middle or inner ear, and also reflexly through irradiation from the motor nerve fibers, as well as indirectly through otitic brain disease, or of the meninges, or of the blood vessels. The ear, as well as the eye, is richly supplied with sensitive nerve fibers from the trigeminus, so it is easily understood that in acute suppurative middle ear inflammation, the pain may be irradiated and felt in the eye. With this pain there may be slight injection of the conjunctiva, lachrymation and sensitiveness to light. Trigeminal neuralgia is thus produced, and may come from exostoses of the auditory canal. It should not be confused with secondary inflammation of the ganglion of Gasser, or of the trunk of the trigeminus. O. has seen two cases having great supra and infra-orbital neuralgia and deep pain in the eye, with acute and chronic inflammation of the middle ear, the ocular symptoms of which disappeared upon operation, one of which was upon the mastoid. In one case the third division of the fifth nerve was affected by the middle ear inflammation.

Urbantschitsch has written extensively upon the relation between the eye and ear. He thinks from his observations upon the influence of irritation of the trigeminus upon the nerve sensation (especially upon the sense of sight) "that the vision can be reflexly influenced through the auditory filaments of the fifth nerve. A result of this condition is, that a disease of the outer and middle ear can produce an influence upon the visual acuity, and that this condition is common." It was pronounced in 14 out of 25 of his cases. O. has gone over Urbantschitsch's methods and examinations, and believes that he has arrived at a safe conclusion, although he has examined 15 soldiers with acute middle ear inflammation who, during the course of the disease, did not have any diminishment of vision. Thus, this question is yet open to proof. The observation of Rampoldi, in which foreign bodies in the outer ear produced blepharospasm, due to reflex of the facialis which was stopped by dropping cocain in the ear, is quoted. The reflex symptoms which proceed from the acoustic nerve, especially from the vestibular branch, are of considerable interest. The twigs of the vestibular nerve are in co-ordination with the centers, for the ocular muscles, which is placed by Högyes, between the corpora quadrigimina and acoustic nucleus. The centrifugal pathway for the co-ordination centers are the nerves of the eye muscles, so there exists between the eye and the ear, a definite working reflex relation which regulates the movements of the eye.

Nystagmus has been produced by irritation of the semicircular canals. Clinical observations, as apoplectiform deafness with Menieres' symptoms, syphilitic disease and traumatic lesions of the labyrinth, suppuration and carious destruction of the canals or pathologic increase of mucus in the labyrinth, has been shown by Lichtheim to produce nystagmus, especially horizontal nystagmus or atonic trembling. A number of cases are observed in the literature of nystagmus, following suppuration of the middle ear with and without polypi, from syringing the ear, from pressure on the inner wall of the tympanum and on the mastoid, as well as the removal of polypi, (by affecting the oculo-motor.) There is no proof from the literature that the pupil can be affected reflexly from the middle ear. There is likewise no proof of reflex paralysis of the eye muscles from ear disease. From our present knowledge and experience, we can only surmise that eye muscles symptoms arise in the course of suppurative middle ear inflammation are set out from reflex spasm from the labyrinth or ear, caused through intra-cranial applications. Nystagmus has been experimentally induced by irritation and injuries to various portions of the cerebrum and cerebelum, and it is no wonder that otitic brain disease affecting the cortex or blood vessels, gives rise to nystagmus.

The production of auditory visual impressions by tones, sounds, noises, etc., is observed in psychopathic persons. There have been some reports of forcible closure of the eye lids producing noises in the ear, and of foreign bodies in the ear producing blephrospasm. It is important to distinguish whether the eye symptoms, spasm or paralysis of of the eye muscles, hyperemia of the papilla or optic neuritis can come through disease of the middle ear without implication of the tonus labyrinth, or whether they arise from intra-cranial complications. There is no proof that the ear can reflexly affect the optic muscles. Many cases of inflammatory changes in the optic nerve occurring simultaneously with acute or chronic suppuration of the middle ear, have been reported. O. has himself seen no cases. Schwartz says, that a conclusion from changes in the papilla of the optic nerve of intra-cranial anomalies, together with middle ear disease of the same side, is always risky, and should only be set forth with great reserve. Swelling of the eyelids is diagnostic of thrombosis of the cavernous sinus. Intra-cranial complications give rise to other eye symptoms which, however, are not of much use for differential diagnosis. Out of the foregoing, it can be seen that we have not found out as much as we desire and the question arises, if we can find out more, and how. A step forward in the diagnosis may be made only by clinical observation and pathologic-anatomic examinations. Extreme disease of the auditory organ proceeding from disease of the eye, has been seldom observed. Moos has described a case of double-sided cataract operation and panophthalmitis of both sides, followed by meningitis, which finally resulted in complete deafness. The literature of the subject is extensively quoted, reference being made to 61 different articles. H. V. W.

Changes in Position of the Human Lens During Accommodation, and Their Measurement. Contribution to the Theory of Accommodation.

HESS, C., Marburg. (*Archiv. f. Oph.*, Band. XLII., Abth. III., 1897.) In a previous contribution the author proved the relaxation of the zonule Zinnii during accommodation, showing that the lens, ordinarily immovable, suffered during contraction of the ciliary muscle a distinct and often very marked tremor with every motion of the eyeball. Tscherning opposes the author's views that this lenticular motion is passive and due entirely to the weight of the lens, with the theory that it is an active motion caused by tension of the zonule in convergence of ciliary muscle contraction. H. argues that if it be true that the lens is actively drawn down by the zonular fibers, then whatever be the position of the eye or head, the lenticular deviation must always be in the same direction. On the other hand, if this theory be true that when the zonule is relaxed the lens simply gravitates passively, then must the direction of lenticular motion during accommodation be much influenced by the position of the eye and head.

To the end of proving his theory H. experimented upon himself as follows: A spectacle frame 12 mm. distant from the eye was used, and in one side was placed a black diaphragm having a minute (0.1 mm. diameter) central hole, in the other a shield shutting out this eye altogether. The spectacle being fixed, the minute hole that transmitted the light always held the same relation to the eye in any position of the head. A series of tests was made, studying the entoptic changes in the lenticular spectrum during an effort of accommodation, both without and after the instillation of eserin, and these conclusions arrived at:

1. Following a strong effort of accommodation the lens sinks by virtue of its own weight.
2. According to the position of the head the lens sinks during accommodation to the temporal, nasal, frontal or infra-orbital side of the ciliary body.
3. When the iris lies horizontal, the lens suffers no displacement toward the ciliary body.

4. Tscherning's explanation of an active displacement of the lens during ciliary muscle contraction is, therefore, unsupported.

5. Eserin called forth much stronger contractions of the ciliary muscle than maximum accommodation efforts.

For measuring the extent of the lens motion during accommodation H. found it convenient to notice the displacement which the "lenticular point" (Linsen Punkt, a point in the lenticular spectrum, preferably one in the middle of the entoptic pupil so seen when the eye is at rest and arbitrarily selected and retained for all observations), suffered in its relation to the entoptically seen pupil (for method of making measurement, see original article). The results of the measurement made upon himself are summarized as follows:

1. With a strong voluntary effort of accommodation the lens sinks from 0.3 to 0.35 mm.

2. If the head, when inclined to the right shoulder, is made to incline to the left, the lens moves twice that distance during the act of accommodation.

3. When the eye is slightly eserinized. the lenticular motion increases markedly during accommodation.

4. In the strongly eserinized eye the inclination of the head from the right to the left shoulded causes a displacement of the lens to the extent of almost 1 mm.

5. The degree of possible ciliary contraction during voluntary accommodation is always considerably smaller than that brought on by eserinization.

The above measurements have only an individual value, but are of interest because they are figured for a normal eye.

Believing that the above demonstrated lateral movements of the lens made it probable that the lens also enjoyed a certain freedom of forward and backward motion, the author made further experiments by testing with special apparatus (see original cut), the near points in the non-eserinized eye with elevated and bowed head, the position of the lens, as is well known, having great influence upon the refraction of the eye. Tests were made by the author upon himself, and upon several colleagues, as a result of which the following conclusions were reached:

1. With strong accommodation effort the near point was found considerably nearer the eye when the head was bowed than when elevated.

2. The far point was found to be independent of the head's position, being at the same place with bowed and elevated head.

3. The scope of accommodation (Breite) is, therefore, much larger in bowed than in elevated head.

4. With a relaxed zonule the lens approaches the cornea when head is bowed, and receded from it when head is elevated.

5. The experiments show that in accommodating for the near point a greater contraction of the ciliary muscle than is necessary to give the lens the greatest degree of curvature possible at any given age, is easily produced, for the described changes in the position of the lens are possible only with a completely relaxed zonule.

Experiments made with reference to the objective demonstration of these movements of the lens gave the following results:

1. The displacement of the lens forward and backward with corresponding head movements, and occurring when zonule relaxed, can be demonstrated objectively by a relative deepening of the anterior chamber when head is elevated and its relative flattening when head is bowed.

2. When ciliary muscle is contracted to a maximum degree the anterior surface of lens in author's eye advances and to such a degree that even when the head is raised it is nearer the cornea than in a non-accommodating eye whatever be the position of the head.

With relaxed accommodation (in author's eye,) the position of the iris, and thus the depth of the anterior chamber, too, are independent of the position of the head.

H. further proves that the changes in position of the lens in the eserinized eye, due to changes in the position of the head, are sufficient to strikingly influence certain phenomena of color-steroskopy and that the focusing of the refracting media of the eye may suffer appreciable changes from the accommodation-displacement of lens.

Furthermore, it is shown that the act of accommodation in the normal eye is attended with no appreciable difference in pressure between anterior and posterior hemispheres. H. has been able to prove that the accommodation of the eye upon the near point does not correspond to the maximum physiological contraction of the ciliary muscle, and makes the distinction of calling that point which hitherto has been termed the near point the "physical (or optical) near point," and that point upon which the maximum (voluntary) contraction of the ciliary muscle would accommodate if the lens were unhindered in its effort to become spherical, the "physiological (or muscular) near point." H. V. W.

Appliances for Ophthalmic Lecture Purposes.

DIMMER, F. (*Archiv. f. Augenhkde.*, XXXIV. Bd., Heft. 1, 1897.) On account of the cost of a stereopticon for the electric arc light, B. has constructed a cheaper instrument which is very useful for projecting pathologic pictures upon a back-ground, which can be seen by a large number of persons. The Auer's gas light, calcium light or electric light may be used. The price of the instrument is 216 marks (about $50.00). He also describes a microphotographic apparus for producing lantern slides, the illumination being obtained from Auer's light. The cost of this is 46 marks (about $10.00). He has taken pictures from Jaeger's hand atlas, and rendered them clear by placing them first in a mixture of 95 per cent. alcohol then in carbolxylol (acidi carbolici in alcohol liquefacti 100 gr., xylolo 300 gr.), which are then gummed to a glass plate by Canada balsam dissolved in xylol, and cover glass placed upon them. These are useful lantern slides, and then projected in their natural colors upon the background. In his lectures up to June, 1896, he used 143 microscopic preparations and 361 pictures for projection. Czermak has also used this method of illustrating his lectures. He describes an ingenious apparatus for demonstration of passage and the refraction of light through the lenses, and in the demonstration of the visual field he uses a board 80 cm. square, mapping out the visual field upon a ground glass placed in front of the patient mounted in a simple manner. A number of points are given which are of interest to lecturers in ophthalmology.

H. V. W.

Arthritis Following Blennorrhoeal Conjunctivitis.

WEISS, L. AND KLINGELHOFFER. W., (*Klin. Mon. f. Augenhkde.*, March, 1897), report the case of a male nurse aged 35, who had been hitherto healthy, never having had rheumatism or gonorrhea, who appeared in consultation stating that two days before, while making an injection in a case of gonorrhœa, a little of the secretion had flown into his right eye. Since the day before there was a feeling as if a foreign body was in the eye, and then the inflammation progressed, presenting a picture of gonorrhœal ophthalmia. The left eye did not become infected. No pus could be pressed out of the urethra, and he had no fever. The eye was treated with 4 per cent. boric acid solution and sublimat 1.10000, afterward permaganat of potash, etc., and later 1 per cent. silver was used. Under this treatment the swelling and secretion quickly diminished. About two months after his first appearance he came stating that three days before he had swelling and pain in the right knee joint. Active and passive movements. as well as touch, were attended with pain. No fluctuation was apparent. In about eight days the swelling disappeared, the fever lasted for four days, fourteen days later the right ankle joint became affected also, lasting about eight days. During this time the patient felt ill, but was able to attend to his business. There are very few cases of joint affection arising after gonorrhœal conjunctivitis. In this case the possibility that the patient had also urethral gonorrhœa before the eye disease is certainly to be excluded. He came in the beginning of the eye affection, and was examined a number of times with negative findings. There has been considerable written between the relation of gonorrhœa and rheumatism, Koenig states that 90 per cent. of patients with acute inflammation of the joints are found to have gonorrhœa. Other authors. such as Fournier, give 54 per cent.; Besnier, 50 per cent. Gonorrhœal iritis, according to Foerster, seems to be a seldom occurrence. Highet has observed a case of neuro-retinitis after gonorrhœa. Joint disease appearing after blennorrhœal conjunctivitis is a much less common occurrence. Besides this case, only fifteen others are reported. Bacteriologic examination was made in only five cases, and in but three of these were cocci found. In the case here reported a puncture was not made, so it was impossible to find out whether the gonococcus existed in the secretion of the joint.

H. V. W.

Hyperbolic Glasses.

Lohnstein (*Klin. Monats. f. Augenhkde.*, April, 1897), who is himself the subject of conical corneæ, shows a hyperboliform cornea is not even approximately corrected by hyperbolic glasses. such as Raehlmann recommended.

The theoretical correcting spectacle glass is concave in the center, convex at the periphery. and is, therefore, fundamentally different from a hyperboloid. By experimenting on himself with some hyperbolic glasses, he found that he saw much worse when he held the center before the eye, but much better when he looked through the margins. Now, the margin of such a glass is equivalent to a cylindric lens, and, as a matter of fact, Lohnstein saw still better with a minus 2 D cylinder. Raehlmann himself remarked that patients decentered their glasses until they found a spot which gave the best results. The same results apply to "conical glasses" (employed by Angelucci and others). It thus appears that hyperbolic and conical glasses have no specific or special action suiting them for the correction of keratoconus, but act only as cylinders. And cylinders have this advantage, that their whole surface is available for use. Their effect on the vision, however, much depends on the size of the pupil. Thus, Lohnstein, with his minus 2 D cylinder, sees much worse in bright daylight, as the pupil is then smaller.

H. V, W.

Acquired Corneal Astigmatism of 32 Diopters.

ASCHHEIM, HUGO, (*Klin. Mon. f. Augenhkde.*, April, 1897,) reports a curious case of As. in a 25-year-old woman who had scrofulous eye disease, the first attack occurring at 7 years of age. Recurrent attacks followed. She came to him for consultation on account of left sided secondary glaucoma, which had followed leucoma adherens. In the R. E. the process had taken a peculiar course. Exactly on either side of the cornea in the horizontal meridian were two strong cystoid corneal cicatrices, to which the iris was attached. The pupil being stretched to a horizontal slit between these points. Through the contraction of these cicatrices, the cornea had become strongly cylindric in the upright image, the horizontal meridian was 10 D. hyperopic, the vertical strongly myopic. The ophthalmometer showed the horizontal curvature of the cornea to measure 19 D., the vertical 51 D., with irregular As., giving a total regular As. of 32 D. Without glasses, the vision was 6 LX; with correcting glasses + 8.00 cyl. ⊂⊃ + 6.00 cyl., 6 XXXVI. The stenopaic shape of the pupil helped the vision remarkably. In addition, the patient had a dysmenorrhœa, which seemed to be intimately associated with the glaucoma, for pain, loss of vision, etc., invariably occurred in the beginning of the menstrual period. The literature of corneal astigmatism is given. Dodd's case of corneal As.—12.00 90° ⊂ + 16.00, 5°, which received ½ normal visual acuity through correction, is quoted.

H. V. W.

Tuberculosis of the Iris.

AMMANN, E. (*Klin. Mon. f. Augenhkde*, May, 1897.) The clinical appearances of tuberculosis of the iris are not always the same, and there are cases where diagnosis is difficult, especially when experimental inoculation has failed. A. reports two cases:

I. A boy, 3 years old; L. E. cornea clear, fine spots on posterior surface, and two flat grayish lumps of the iris in the peripheral temporal corneal edge. In the contiguous area, the sclera was slightly reddish and bulged. There were many posterior synechiæ and the fundus examination was impossible, on account of diffuse opacities of the vitreous. The R. E. was normal. There was slight swelling of the preauricular and the sub-maxillary lymph glands, at first only on the left, but later on both sides. Sub-conjunctival injection of iodoform vaselin was made, and later, iodoform injected into the anterior chamber. The nodules in the iris disappeared within three months, but later reappeared. The lymph glands became greatly enlarged. A new lump appeared in the iris, the sclera became more swollen, the tension increased, and the fibers became more opaque. Eight months after first examination enucleation was made, and there was found a grayish-yellow mass in the vitreous chamber, and whitish tumor of the ciliary body, iris and choroid, which appeared to be a granulation mass composed of collections of round cells with central wandering cells, with but little connective tissue. These foci were found in all the ocular tissues, and are minutely described, being evidently of tubercular origin, although a large number of sections were made and examined for tubercular bacilli, none were found.

II. A man 50 years old who had chills, fever and pain, in the right leg. Seven months later it was amputated above the knee, on account of fungus tuberculosis. The operation was normal, and no metastasis was found in any organs, except that three weeks after he could not see with the right eye. The inflammation was treated by atropin and ice, but did not get better. About a month afterward he was generally well, except the right eye, the pupil of which was filled with a fibrinous purulent exudate. The cornea was cloudy. The fundus could not be seen. A few days later a number of yellowish points could be seen on the posterior surface of the cornea. Two months later the exudate almost filled the anterior chamber, and a yellowish lump came in the sclera and cornea. There was under tension. A little of the material was drawn from the anterior chamber by aspiration and injected into a rabbit's eye, serum-agar cultures being likewise made. The yellowish lumps in the cornea and sclera became larger, and the eye was later enucleated. The stump healed well. An ostitis of the end of the radius of the right arm began, and fistula developed in the stump of the leg where amputated. He afterward left the clinic and was not again seen. No tubercular cultures resulted. Microscopic examination of the specmen showed it very much the same as in the first case. The process extended throughout all the tissues of the eyeball. Tubercular bacilli could not be found. Inoculation experiment was also made in a guinea pig, injection being made into the inguinal region, and fistula resulted upon the spot of the injection and enlarged lymph glands. The injection was made not intra-peritoneal, but under the skin. No bacilli were found upon examination. He recommends inoculation experiments upon animals, in order to determine the tubercular character of the process, and not to depend upon the examination for bacilli. H. V. W.

Etiology and Treatment of Follicular Disease of Human Eye.

BURCHARDT, (*Centralbl. f. prakt. Augenhkde.*, Feb., 1897,) has excised pieces of mucus membrane from trachomatous eyes, and reports more particularly upon preparations from a typical case of granular trachoma occurring in a girl 11 years of age, which had existed for two years without causing pannus. There were an immense number of trachomatous nodules which were not attended with appreciable inflammation. The sections were prepared in formalin and stained light green with Loeffler's methyl blue. When enlarged 500 diameters, the epithelium covering the follicles seemed to be intact. The granulations were composed of masses of oval bodies of pale-rose color in the unstained preparation. They were sharply defined, and seemed to be mostly between $\frac{1}{70}$ to $\frac{1}{40}$ mm, long, and but $\frac{2}{3}$ as wide as long, without nuclei, not allowing the cell walls to be distinguished. The bodies seemed irregularly marked by fine wavy lines and are separated from one another. They are readily distinguished from the much smaller nuclei of the epithelium. He has found these bodies in other cases of characteristic trachoma, and believes that they are characteristic of granular conjunctivitis. He is positive that these bodies are cause of trachoma nodules. When the preparations are kept at blood heat, they display no ameboid movements. On account of their size, their long oval form and their uneven covering, he considers that these are not round cells, but come from the contagious micro-organisms, which are the cause of trachoma. His inoculation experiments, however, have proved negative in healthy eyes, and in the skin of all cases. It is certain that the infection at first affects the epithelium, but does not there cause great changes. In those cases which do not have much inflammation, its surface and appearance remains much the same. Some of the infection gets behind the epithelium and there causes the formation of trachoma bodies or follicles. There is usually to be seen a thin layer of connective tissue between the contents of the follicles and the epithelium, especially if the section be made a little obliquely. In a hitherto sound conjunctiva with a feeble form of infection, the disease proceeds slowly and without much inflammation, but if the infection be severe, the picture of an acute inflammatory trachoma occurs. In such a case, the general swelling and filling of the blood vessels of the conjunctiva so disguises the follicles that they are difficult to find, and the process decidedly resembles blennorrhæa. He does not believe in applications. such as caustics, etc., which destroy the epithelium. He condemns as barbarous, the excision of the retro-tarsal fold, which removes a large quantity of healthy tissue. the rubbing in of strong sublimat solution, which causes scar tissue without curing the diease and expression with Knapp's forceps which does not squeeze out all of the trachoma bodies. many of which are retained in the epithelium, and thus the cause of the trachoma remains. He strongly recommends puncture of each individual follicle with a very fine galvano cautery, which he claims is attended by very little reaction and does not cause cicatricial tissue. He has burned out as many as 150 follicles in one sitting, finding on the next day but very little swelling. and that on the third day all irritation has passed away. The disease is cured in 4 to 8 treatments of 10 to 14 days apart. In one case he made 397 punctures, in another over 400. curing the cases without formation of cicatrices. In acute trachoma and in old cicatricial cases, the bodies are hard to find. Focal illumination brings them into view. His after treatment is the use of 1:1000 sulphat of copper wash. Immediately after the instillation, calomel is vaporized and blown in. Later, instead of calomel, thioform is used. He states that as the cause of the follicular diseases is sporozöen, he has used chinolinum tannicum, and chinium tannicum, dusted in the eyes. The first is irritating, so he prefers the second. He is experimenting with tannate of quinin in the treatment of granular conjunctivitis without the use of the cautery.

BURCHARDT, (*Centralbl. f. prakt. Augenhkde.*, April, 1897,) adds a correcting note as follows: In recent preparations made from different eye diseases not complicated with trachoma, I have recently seen in a large number what seemed to me to be trachoma bodies. I am convinced that these appearances did not stand in causative relation to the follicular disease. and cannot be given the name of trachoma bodies. The treatment of trachoma with galvano cautery of each individual follicle is the best method, as the follicle masses are invariably covered over with epithelium. H. V. W.

Two Cases of Congenital Malformation of the Eye. (Partial Cleft of the Iris.)

PELESOHN, Hamburg. (*Centralbl. f. prakt. Augenhlkde.*, April, 1897.) During refraction of a laborer, the following was accidentally discovered: On the iris of the otherwise normal eye, down and out, beginning near the vertical meridian and half filling the corresponding quadrant in the ciliary region, a dark semi-circular spot, diagnosed at first as irido-dialysis, an attempt to use the ophthalmoscope, showed it opaque. On careful observation only the anterior surface, or stroma, of iris was found involved, pigment layer being unaffected. Iris stroma was differentiated from the defect by a sharp semi–circular mass, convex edge toward pupil, the normal stroma lying directly next; the radiating fibers in the defect proceeding from periphery and the circular fibers having convexity toward pupil, a single bundle of fibers passing over the sharp edge to front of cornea in same manner as fibers of a pupillary membrane pass over pupil edge on to capsule of lens. Cornea in region of defect is grayish-white or turbid, and along limbus shows two fine radiating sclerotic strips. Patient denied history of trauma. The sharp limitations of defect undoubtedly show congenital appearance, which is not to be classed under usual description of coloboma or pseudo-coloboma of iris, or fœtal eye fissure. In its development the iris is made up of three heterogeneous layers of which the outer consists of the head plates, the middle of the outer and inner, and the inner of the inner leaf of the secondary eye vesicle. The union commences next the pupil edge, then proceeds toward the periphery; if the union does not occur, there will be a paucity of tissue resulting in the above defect, which is rare; or a total cleft.

Binocular Congenital Hereditary Ectopia Lentis.

Laborer, age 39, consulted P., with high grade of myopia and muscæ volitantes. He stated, when 7 years old, dislocation of lens was discovered. The same condition was found in his mother, her sister, and a cousin, not descended from the latter. Later, it was discovered in patient's 6-year-old daughter, excepting that it was symmetrical in both eyes. In patient's R. E., lens was up, out and anterior; L. E. up, in and anterior. The iris in both eyes in upper right quadrant was bulging; anterior chamber shallow, while to left and down it appeared deeper; iris sluggish. If not artifically dilated, lens edge in R. E. is not visible; in L. E. lens can just be seen past pupil edge. In partial mydriasis, the black sharp contour of lens edge is seen to rise in both eyes obliquely from right below to left above and inclined toward posterior. Lenses seem to be fixed in this position, even in dorsal decubitus. Vision through lens is excessively myopic: in aphakic condition, slightly hypermetropic. He uses R. E. for near as it is strongly myopic and left by squinting lids to cover aphakic pupil, and so accommodates for distance. Patient states he has noticed no change in vision, so there has been no essential change in position of lenses. The muscæ volitantes are due to numerous easily movable vitreous opacities in the left eye, which is constantly over accommodated; while the right, which is myopic and free from accommodation, remains intact. P. recommends extraction of lens. H. V. W.

Hysteria With Strabismus and Ptosis.

Hitzig, E., Halle (*Berl. Klin. Woch.*, No. 7, Feb. 15, 1897), points out that disorders of the oculo-motor mechanism are rare in hysteria, though diminishment of the field and other phenomena due to fatigue of the retina, are common. Cites a Polish laborer, 36 years of age, had previously suffered from "inflammation of the eyes"; used alcohol freely. In August, 1895, received wound in leg. Wound healed rapidly, but he got the idea that inflammation would set in in another portion of the body, as there was no suppuration. The following week he in reality developed inflammation of the eyes, followed by diplopia and ptosis. This condition lasted a long time without discomfort, but when he found himself unable to see his children returning home in September, 1896, he attempted suicide by drowning, and for two days appeared insane. He was admitted to the hospital in September, 1896, with ptosis complete on both sides, and both eyes turned inward and downward. In November the pupils failed to react to light, and patient claimed he could see nothing. There was no apparent spasm of the orbicularis muscle, there was partial loss of taste, and smell on one side; absence of tactile sensation over whole body; analgesia in right arm, left leg, left half of trunk, neck and head. Temporary improvement in eye symptoms followed chloroform narcosis in October, and complete disappearance followed electricity and suggestion in November. Temporary partial hysteric deafness was recovered from. In January 1897, patient's condition was practically normal. Some of the eye symptoms were due to spasm, evidently the squinting and myosis. Charcot, in 1888, still believed that all so-called hysteric unilateral palsies of the facial, lingual and oculo-motor muscles were in reality, hemi-spasms. Charcot and his followers afterward had to modify their views, and in the present case, Hitzig attributes ptosis to hysterical paralysis of the levator muscles of the eyelids.

H. V. W.

Suppression of Trachoma in Prussia.

KIRCHNER, (*Berl. Klin. Woch.*, Nos. 9 and 10, March 1 and 8, 1897,) in an address delived before the Berlin Medical Society, states that the European infection with trachoma may be attributed to Napoleon's soldiers, who contracted the disease in Egypt, in 1798. Since 1850, there has been a decline, and now it has confined itself more or less to Russia, Hungary, Belgium and eastern Prussia, and of the latter, it is principally the regions bordering on Russia and Austro-Hungary, that are infected. From 1867 to 1889, there was a great decrease in trachoma in the army, but an increase among the people. In eastern Prussia and Posen its prevalence is due to poor hygienic states, overcrowding, lack of occupation, poverty, alcoholism, etc. Its endemic existence in families and schools, leaves no doubt as to its contagiousness. It has been shown that infected farm hands from Posen in search of work carry the disease to eastern Prussia districts and spread it among the laborers there. In Hungary there are four trachoma centers, and the diseased are estimated at 30,000. The government is endeavoring to combat the disease by the appointment of a trachoma inspector.

As to the deleterious results of trachoma: Firstly, the children affected suffer in mental development by being detained from school for months or years, and in some eastern Prussia districts as many as 31 per cent. to 80 per cent. of all school children are shown to be trachomatous;

secondly, the working capacity of the affected individuals is limited; thirdly, the spread in the army among able bodied men reduces the army capacity of the nation, though it is true that strict hygienic precautions have markedly reduced the number of affected soldiers.

As a remedy for the evil. it is suggested by a committee appointed to investigate: First. to erect hospitals and dispensaries in trachomatous districts for the treatment of trachoma only. this being the only possible way of isolating the cases and preventing their spread; secondly. it is essential that all physicians in trachomatous districts be thoroughly drilled in the diagnosis and treatment of trachoma. Furthermore, the poor must be treated gratis, and systematic examinations of school children must be carried out. Other considerations are, the compulsory detention and treatment if possible, of infected individuals who expose others to contagion, and the proper instruction of the laity in the dangers of the disease and the necessity for proper care. Statistics should be carefully gathered.

H. V. W.

Trachoma in East and West Prussia.

HIRSCHBERG, (*Berl. Klin. Woch.*, Nos .10 and 11, March 8 and 15. 1897,) in an address delivered at the Berlin Medical Society, mentions that historical evidence traces trachoma back at least 3400 years. (Papyrus Ebera.) Hipocrates, Claus, Galen and others, describe the condition very well. Its original geographic distribution is difficult to ascertain, though our first records of its existence come from Egypt. It was prevalent among the ancient Greeks and Romans, and the Arabians in the middle ages, and was known in Austria before Napoleon's visit to Egypt. While it is true that to Napoleon's returning troops may be attributed much of the subsequent spread of trachoma in Europe, yet it is quite probable that the disease existed before this in Russia and the Baltic Sea districts, and possibly in Prussia, too. As to its present distribution, a few infected districts exist in Germany, France and England, more in Hungary, and even more widely distributed in Russia, Spain, Italy and Greece; likewise in Arabia, Persia, Egypt, India, etc. Australia and North America have been infected by immigrants; of the South American states, Brazil is infected most. It is a fact, that trachoma is to be found in low countries only, and does not exist 600 meters above the sea level, as in Switzerland and Tyrol.

In two little Prussian villages, counting 1000 inhabitants, Hirschberg found 10 per cent. of all suffering from trachoma of different grades. The village schools shows the highest percentage of affected pupils, the city schools much less, and the high schools least. As to its treatment H. prefers expression of the granules to excision of the affected conjunctiva. Other treatment, sublimat massage, applications of copper, silver, zinc, etc., have their place.

H. V. W.

1. A Case of Left-Sided Visual Field Defect of the Right Eye. 2. A Case of Embolism of Both Central Retinal Arteries.

GRAEFE, A. (*Deut. Med. Woch.*, No. 13, March 25, 1897,) reports (1) a case of right-sided hemiopia, the left half of the field being defective and the line of division passing exactly through the vertical meridian. Right eye was found normal. The condition came on suddenly five years ago, protracted sea bathing being looked upon as the cause. The explanation is given that in all likelihood the condition is a left-sided hemianopsia, due to a central lesion, a hemorrhage, and not the defect that was originally existing in the left eye which, also, had gradually disappeared.

(2) In a 68-year-old woman with atheromatous temporal and radial vessels, Graefe observed embolism of the central retinal artery of left eye with sudden blindness of that eye, followed in several months by a like condition in right eye. Numerous retinal hemorrhages existed also. An apoplectic attack later caused patient's death.

H. V. W.

The Detection of Foreign Bodies in the Eye By Means of the X-Rays.

DAHLEFELD, C. AND POHRT, N. (*Deut. Med. Woch.*, No. 18, April 29, 1897,) report having experimentally obtained excellent skiagraphs of foreign bodies, such as shot and pieces of wire, as small as I. O X O. 4 mm., which were artificially introduced into the orbits of cases with phthisis bulbi. The photographic plate was placed against the temple of the side corresponding to the injured eye, and the vacuum tube 10–15 cm. distant from the other temple. A practical application of the test was made in the case of a laborer, and it resulted in the discovery and location of a 3x1 mm. piece of iron. It is suggested that in each case several skiagraphs be made, each approaching the eye from a different direction, so as to clear the lateral orbital border.

A good apparatus, experience and an eye well trained in the interpretation of skiagraphic pictures, are essentials to the practical application of the Röntgen rays, for the detection of foreign bodies in the eye. H. V. W.

Distance of Retinal Veins as Cause of Recurring Retinal and Lenticuiar Hemorrhages in Adolescents.

SCHEFFELS, OTTO, (*Deut. Med. Woch.*, No. 13, March 25, 1897,) records four cases of double-sided retinal and lenticular hemorrhages, in 2 of which there were perivascular inflammatory areas in both eyes, though it is possible that the other two cases that now showed perivascular changes in one eye only, may also have originally been defective in both eyes. In all cases the perivasculitis disappeared in the course of 2 to 3 months. S. claims that these lenticular hemorrhages, though formerly attributed to disease of the ciliary vessels, are often due to disease of the retinal veins, and comes to the interesting conclusion that where general examination and previous history are negative, hereditary lues may be looked upon as the cause of the perivasculitis. H. V. W.

Central Double-Sided Amaurosis Due to Metastic Abscesses in Both Occipital Lobes Without General Symptoms.

HEINDORF (*Deut. Med. Woch.*, No. 15, April 8, 1897.), mentions that in blindess without ophthalmoscopic finding the pupillary reaction is of greatest importance, for if the pupillary reaction is unaffected we may argue a lesion on the further side of the reflex arc. Of central amaurosis not due to organic lesion of the brain, may be mentioned: uremic, hysteric and that occasionally following blepharospasm in children. Besides this organic brain lesions (tumors, cysts, trauma, emboli, etc.) are causes of central amaurosis, but only those that leave the pupillary reaction unaffected, that is of the further side of the reflex arc in the geniculate bodies and presenting no sensory disturbances are considered. But 7 cases of uncomplicated double amaurosis due to isolated lesions in both occipital lobes without any or but faint matter or sensory disturbances, are recorded in literature. Embolic softening is the cause of all of these. H. adds another interesting case of his own observation in which metastitic abscess in both occipital lobes were the cause of the condition.

H. V. W.

The Action of the Eye Muscles and the Manifestations of Palsies.

ZOTH, OSCAR. (*Munch. Med. Woch.*, No. 9, March 2, 1897.) The author has successfully accomplished his purpose of demonstrating on a physiologic basis: The laws of the ocular movements, the condition of single vision and the origin of double pictures in muscle palsies. This subject-matter, so difficult for beginners, is much simplified by two diagrams in the text, and by plate 1, based upon the 3 axes of Fick's system of co-ordination. Plate 2, an alterable plan for developing double pictures in their manifold varieties, will find ready application for didactic purposes. H. V. W.

Examination for Color-Blindness, with Special Reference to Railroad Employes.

GORTY. (*Munch. Med. Woch.*, No. 8., Feb. 23, 1897.) After acuity of hearing and vision has been satisfactorily demonstrated, a number of colored pencils, the wood of each of which corresponding in color to that of the crayon, are placed before the applicant with the order to pick up the pencils one by one and write upon a sheet of white paper the name of the color of the pencil in hand, *e. g.* with a red pencil the word "red" is written, with a green one, "green," etc. Another purpose is served by this examination. The paper on which this writing is done by the applicant is signed by him, together with a statement that the above colors were drawn by him, and this paper can be filed away for reference, so that if at any future time complaint of unfair dealing is made by a rejected applicant his record is witness of the test made. In case the applicant cannot write legibly, a second party may write to his dictation.

ADLER, HANS, Vienna (*Munch. Med. Woch.*, March 30, 1897), claims the distinction of having employed the above method as described by Dr. Görty for several years past and of having published same in 1891. In 1893 the Austrian imperial railroad adopted Dr. Adler's method, together with his suggestion that records be kept of the applicant's own papers.

Dr. Görty, in a second communication, acknowledges Dr. Adler's claim of priority in publication, though he was until now unaware of it; he gives proof, however, of his having used this method since 1884, thus antedating Dr. Adler by several years. H. V. W.

Four Hundred Senile Cataract Operations.

EBNER (*Munch. Med. Woch.*, No. 11, March 16, 1897,) reports 400 cataract extractions performed by Prof. v.

Rothmund, during a period of six years. The peripheral linear extraction method of Grafee was used in the greater number of cases. Thorough antiseptic preparation of the eye on the evening before operation was carried out. Discission for secondary cataract was done 46 times, iridectomy 12 times. Extraction a deux temps was practiced in 24 cases with good success in 68% of them. Of the 400 cases, linear extraction (upward) was performed 370 times with the following results: complete success (V. 1-1/10) in 64.3%; failure (V. 1/200 to 1/00 in 5.4%; loss of eye in 1.6%. H. V. W.

Infectious Conjunctivitis.

Coppez (*Soc. Belge d'Ophtal.*, Dec. 20, 1896,) gives the following classification: The gonococcus may cause purulent, catarrhal, granular, or pseudo-membranous conjunctivitis. Weeke's bacillus may cause catarrhal, phlyctenular, purulent-granular and pseudo-membranous forms. The streptococcus may cause lachrymo-catarrhal, pustular and pseudo-membranous forms. Staphylococci may be responsible for catarrhal, purulent, phlyctenular and pseudo-membranous conjunctivitis: and the Klebs-Loeffler bacillus for catarrhal and pseudo-membranous.

H. V. W.

Gonorrhœal Inflammation of the Conjunctiva and Its Sequelæ. Treatment of External Eye Disease by Insufflation of Different Medicaments.

Burchardt, M. (*Charite Annelles* XXI, 1896.) The several eye diseases in the foregoing title are fully and clearly described. Many experiments have been made by the author with powders insufflated into the conjunctival cul-de-sac; calomel, iodoform. acetate of silver (itrol), pure oxide of silver, lactate of silver (aktol). nosophen (tetrajodphenolphtalin), thioform (bismuthum aithiosalicylicum), and loretin in conjunctivitis and keratitis eczematosa as well as in ulcers of the cornea, together with nosophen and thioform. These are mixed with talcum to prevent irritation, and lightly dusted in. H. V. W.

ABSTRACTS FROM CURRENT SPANISH LITERATURE.

By A. B. Hale.

Keratitis Interstitialis.

Santos, Fernandez (*Cronica Medica de Habana*, No. 5, 1897), agrees with Panas that Keratitis Interstitialis is not wholly due to syphilis, but must be to some extent a cachexia. For otherwise the disease would more frequently attack adults as well as children. He then reports a case where all the classical treatment availed nothing, and he was convinced that rheumatism lay at the bottom of the trouble. Injections of bichloride solution 1 drop of a 1.1000 solution were then given with marked and rapid improvement, so that the eye was well in four months.

Operative Work at Madrid.

Santa Cruz (*El Siglo Medico*, No. 2253, Feb. 28, 1897,) gives a resumé of the Operative Work in the Ophtholmic Institute for 1896:

365 cataract operations.
22 discissions.
85 iridectomies.
158 general operations.
16 enucleations.
5 strabismus cases.
651 total.

In the cataract cases there were four losses of vision. In all, there were only four cases of subsequent suppuration.

Detection of Color-Blindness.

Revista de Ciencias Medicas (Barcelona. April 10, 1897,) has analyzed and tested the method of detection of color-blindness as used by Görty, which consists of the test by colored pencils, each containing a crayon of the same color as the wood; the suspected person is requested to write the name of each color with its own pencil—confusion pencils also being used—and to affix his name with the same pencil. This method seems to the *Revista* to be an excellent one, for the following reasons:

1st. It is rapid and can be easily employed by any physician.

2d. There is no fear or suggestion in it, and it appeals to the one examined as objective and impartial.

3d. A mistake is inexcusable—lack of light, confusion of shades, soiling of wools by exposure or use, etc., being impossible.

4th. There is at the same time given a test of color perception and documentary evidence of the tested person's capabilities.

ABSTRACTS FROM CURRENT AMERICAN AND ENGLISH OPHTHALMOLOGICAL LITERATURE.

By Charles H. May, M. D.,

NEW YORK.

Some Practical Observations Upon the Bacteriology and Treatment of Catarrhal Ophthalmia.

Stephenson, Sydney, M. B., of London, Eng. (*The Lancet*, June 5, 1897.)

"Acute catarrhal ophthalmia, or muco-purulent conjunctivitis, is one of the commonest eye diseases met with in this country. Its contagiousness and epidemic tendency endow it with considerable practical importance, especially to those in charge of schools and similar institutions. Its symptoms, no less than its treatment, are known to every practitioner of medicine; there are, nevertheless, points in both that will repay study. The object of the present paper (which is based upon a somewhat large experience with the malady,) is to describe (1) the bacteriological diagnosis of catarrhal ophthalmia, and (2) those modes of treatment which I have found of most service. In the light of modern advances, catarrhal ophthalmia must be regarded as due to a specific organism. This fact was first pointed out by Koch, who, during a visit to Egypt in 1883, examined bacteriologically some 50 cases of the ophthalmia of that country. He found two microbes in the eye-discharge, the one associated with the severe, the other with the mild form of the disease. The former appeared to be identical with Neisser's gonococcus, while the latter he described as a very small bacillus. Haensell spoke, in 1886, of having found an organism in catarrhal ophthalmia. In the same year Weeks published a careful memoir upon the subject. He discovered that small, well-defined bacilli were always present in the secretion of catarrhal ophthalmia; inoculation of the eyes of rabbits and guinea pigs gave negative results, but he succeeded in setting up the disease when the specific pus was implanted on the human conjunctiva. He failed to obtain a pure culture of the organism, as he found a small club-shaped bacillus in all his cultures. In six instances inoculation with the mixed growth gave rise to acute inflammation of the conjunctiva; the clubbed bacillus was found to posses no pathogenic properties. In 1887 Kartulis described the same organism in cases of Egyptian ophthalmia. Out of six inoculations of the human eye, Kartulis set up the disease twice. Morax (1894,) concluded from his observations that the small bacillus was constantly present in this form of ophthalmia. Although inoculation with a pure culture failed to produce any result in animals, yet it set up an inflammation in his own eye. Somewhat later H. E. Juler mentioned the fact that he had met with the same organism in many. but not in all, cases of catarrhal ophthalmia. But apparently he had not attempted to cultivate it. Weeks has recently reviewed the state of our knowledge concerning this microbe (1895). 'Since the first observation of the micro-organism,' he says, 'the writer has examined between one and two thousand case of acute contagious ophthalmia, and has made many microscopical examinations of the secretion. Of the cases examined the bacillus before mentioned was found to be a constant factor in the secretion.' During the course of last year Morax and Beach published a full account of their experiments with this bacillus, which they managed to cultivate upon agar-agar, with or without the addition of human blood serum. These authors express the definite opinion that acute catarrhal ophthalmia 'invariably coincides with the presence of a small specific bacillus.' For some years past I have made a point of examining bacteriologically the secretion from all doubtful cases of catarrhal ophthalmia that have fallen under my notice, and can fully confirm the observations of Weeks, Morax and Beach. As stated in a work published a short time ago, I am persuaded in my own mind that the presence of certain slender bacilli may be taken as diagnostic of this form of conjunctivitis, and, further, that the number of organisms present is directly proportionate to the severity of the case. Further experience has strengthened these views, so that I have come to regard a microscopic examination of the discharge from any inflamed conjunctiva as essential to a satisfactory and scientific diagnosis.

"In a case where the surgeon suspects catarrhal ophthalmia, a first step is to make preparations from the stringy secretion present in the conjunctival sinuses. This is best done by everting the lids and removing a particle of discharge by means of a platinum loop, previously heated to redness and then allowed to cool. Two perfectly clean cover-glasses are next smeared with the pus, allowed to dry, and passed slowly two or three times over the flame of a spirit lamp or a Bunsen burner. They are next floated for a couple of minutes upon a 15 per cent. solution of acetic acid. thoroughly washed, dried, and once more heated. One of the cover-glass preparations is then stained with either Löffler's alkaline or with Kühne's carbolic methylene blue for five or ten minutes. The second, after immersion in absolute alcohol for two minutes, is treated by Gram's method, and counter stained with a 0.5 per cent. solution of eosine. The specimens thus obtained are washed with distilled water, dried, mounted in Canada balsam and xylol. and examined microscopically with the aid aid of a 1 — 12 oil-immersion lens and Abbé condenser. If the case be one of catarrhal ophthalmia the preparation stained with methylene blue will be found to contain many polynucleated leucocytes and some epithelial cells in addition to the pathogenic microbes. The latter are short bacilli, varying in size from 0.75μ to 1μ. They resemble rather closely the bacilli of mouse septicæmia, but are smaller, and have rounded instead of angular ends. They occasionally form short chains by juxtaposition. They evince a special tendency to become grouped in the protoplasm of the pus cells, which in some preparations are literally loaded with them. Now and again the bacilli may be noticed to cling, as it were, to certain of the epithelial elements. Often enough, too, they may be seen lying free. They nearly always stain evenly: in the fresh organism I have never observed any signs of segmentation or sporulation. It is important to note that they become decolorized by Gram's method, so that in the second preparation one often enough fails to find a single microbe answering to their description. Intermixed with the organism of catarrhal ophthalmia the clubbed bacilli described by Weeks may be sometimes found. The two forms can be scarcely confused. inasmuch as the latter retains the stain of Gram's method. I incline to agree with Coènod in thinking that these micro-parasites are identical with the so-called pseudo-diphtheritic bacilli, which are so often found in the mouth and upon the healthy conjunctiva. Their morphological appearances and staining and cultural reations, at all events, are wholly consistent with such a view. In severe catarrhal ophthalmia the short bacilli occur in great numbers after the lapse of the first few hours. I have seen cases of this sort where scarcely a leucocyte in the specimen was free from one or more organisms. In mild types of disease, on the other hand, they may be scanty that a careful search has to be made to find a single one, and, as everybody is aware who has examined for scattered microbes with high powers of the microscope, this process is likely to involve no small outlay both of time and trouble. Hence, negative results possess merely a negative value. and do not altogether exclude the existence of slight or commencing catarrhal ophthalmia. The pathogenic organisms become progressively fewer and fewer with the subsidence of the disease, but persist to some extent as long as discharge continues to be thrown off from the conjunctiva.

"There are three types of acute inflammation of the conjunctiva in which I have found the short bacillus. These are: (1) Classical catarrhal ophthalmia, the symptoms of which are so well know that they need not be described in this place; (2) a form associated with a large phlyctenulæ in and about the conjunctiva—the 'pustular' cr 'aphthous' disease of the older writers: and (3) a variety in which follicular enlargement is superadded to signs of acute inflammation. Once only have I found the micro-parasite under other circumstances—namely, in a child suffering from chronic dacryo-cystitis. Secretions pressed through the canaliculi into the conjunctival sinus contained numerous organisms of the kind. In relapses of catarrhal inflammation the bacilli are usually to be found in great numbers. It seems probable that in many instances these relapses simply mean re-infection brought about by the mingling of patients in various stages of the disorder. But in other cases we must assume that the organisms, incompletely subdued by treatment, have again obtained a mastery over the natural defenses of the conjunctiva. All who have worked with the bacillus of catarrhal ophthalmia agree as to the difficulty of cultivating it. Weeks, after many experiments, came to the conclusion that it grew best upon 0.5 per cent. agar-agar at incubation temperature, an observation confirmed by subsequent writers. Speaking for myself, I have failed completely with potatoes, gelatin (10 per cent. and 20 per cent.) and blood serum. I have succeeded but rarely with 1 per cent. to 2 per cent. agar-agar, but have been somewhat more fortunate with the medium recommended by Weeks, especially when glycerised. In my experience, however, the bacillus grows much better on serum-agar, prepared in accordance with the directions given in *The Lancet* by Dr. A. A. Kanthack and Dr. J. W. W. Stevens. In tubes of this material colonies of the specific bacillus may be generally observed within 48 hours after inoculation from a case of marked catarrhal ophthalmia. They are round, oval or angular in contour, grayish-white, and so transparent that they may be readily overlooked. When magnified they are found to have a dew-like appearance, more easily recognized than described. The colonies remain discrete for many days; even after long growth they seldom excede 0.5 mm. in diameter. It is to be noted that the organisms soon lose their vitality, so that it is usually a difficult matter to transplant them after the lapse of three or four days. Under such circumstances, moreover, they stain imperfectly and show signs of involution and degeneration. It is, perhaps, fortunate that cultivation is by no means essential to diagnosis. The staining of cover-glass preparations made from the eye discharges is sufficient for all clinical purposes.

"The state of our knowledge as to the organism of catarrhal ophthalmia appears to me to permit of the following conclusions being drawn: (1) The bacilli are to be found at some stage in every case of catarrhal conjunctivitis, and constitute the only certain diagnostic of that disease; (2) their numbers stand in direct relationship to the severity of the symptoms; and (3) they are difficult to grow upon artificial media and are readily killed by antiseptics, drying, or perhaps by mere lapse of time. A clinical distinction is often drawn between a muco-purulent (or yellowish-white) and a purulent (or yellow) discharge from the conjunctiva. This difference possesses some practical importance from a diagnostic standpoint. It is, however, mainly quantative, and depends upon the relative proportion of migrated leucocytes. The characters of the exudation must obviously be the resultant of two factors: *(a)* the strength of the excitant, whether mechanical, chemical, or septic; and *(b)* the reaction of the conjunctiva to that stimulant. While it is broadly true that catarrnal ophthalmia is associated with a yellowish-white and the purulent disease with a yellow discharge, yet exceptions to this general rule are by no means uncommon. This element of confusion probably accounts for the views of some writers, who appear to think that the contagious ophthalmiæ form a series of closely related and interchangeable disorders, ranging from the muco-purulent to the purulent type. As a matter of fact, the diagnosis of every case should be based, not upon the naked eye characters of the secretion, but upon the organism contained in that fluid. Thus, if gonococci be present, we are dealing with a specific purulent ophthalmia, whereas, if the bacilli described above be found, we have to do with a specific muco-purulent, or catarrhal, ophthalmia. In other words, these affections of the conjunctiva are of a specific nature, and no more tend to pass into one another than scarlet fever tends to merge into German measles, or typhoid fever into diphtheria. Indeed, the time has come when the old designations might be replaced by others more in keeping with the present state of knowledge. We might now fitly speak of conjunctival inflammations as due to gonococci, to trachoma-cocci, to Weeks bacilli, to streptococci, to Klebs-Löffler bacilli, or to pneumococci—to name some of the forms only that can be identified with more or less approach to certainty.

"With regard to treatment, the experience of some hundreds of cases has convinced me that nitrate of silver is the sovereign remedy for catarrhal opthalmia. Under its influence redness and discharge subside, œdema of the lids is reduced, and the patient's discomfort is speedily abated. The acuter symptoms seldom withstand more than three or four applications. Whenever the diagnosis is assured the sooner silver is resorted to the better. In the mildest forms of disease only can we afford to dispense with it; the severer the type the more fearlessly may it be applied. The 2 per cent. solution in general use can hardly be improved upon. It is far more efficient than the 0.5 per cent. or the 1 per cent. liquid, and causes no more discomfort. It should be brushed over the everted conjunctiva, which has been first carefully freed from secretion. So far as possible its action should be limited to the mucous lining of the lids by attention to the two following points: First, the brush should be barely moistened with the lotion; secondly, any surplus silver should be soaked up from the conjunctiva by a swab of absorbent wool damped with weak corrosive sublimate. Neglect of these precautions will be likely to entail damage to the mucous membrane, and thus interfere with the regular application of our most potent remedy. According to my experience, silver is not contraindicated by corneal complications. as, for example, the small peripheral ulcers occasionally met with, especially in adults. Under no circumstances, however, should it be applied when raw or bleeding spots are present about the conjunctiva, for if that were done not only would needless pain be caused, but cicatrices also would probably result. The discomforts inseparable from a treatment applied at night are avoided at the Hanwell Ophthalmic School by using the silver in the early morning.

"The following observations appear to throw some light upon the *modus operandi* of lunar caustic. A cover-glass preparation from a case of acute catarrhal ophthalmia, as already explained, will be found to contain pathogenic bacilli and polynucleated leucocytes along with epithelial cells. Now let preparations be made from such a case four, eight, thirteen, sixteen, twenty and twenty-four hours after a 2 per cent. solution of silver nitrate has been brushed over the conjunctiva. Organisms, although plentiful before the application, will be almost or altogether absent from specimens obtained during the next twelve hours; but there will be a notable increase in the number of epithelial cells and fibrin filaments. Even sixteen hours afterward, the bacilli are few and far between and stain imperfectly. As a rule, however, after the lapse of twenty hours, there will be no great difficulty in finding them in most parts of the preparation. If the case be now left without treatment they soon multiply, so that within forty hours after silver was used almost as many will be present as in the original specimen. The same sort of thing may be shown in a different way. It has been already stated that there is considerable difficulty in growing the organism of catarrhal ophthalmia, but the difficulty becomes an impossibility if tubes be inoculated at any time within twenty hours after the employment of silver. From these facts we conclude that this agent acts by direct destruction of microbes. It is of practical interest to note that the latter in my experience are always confined to the surface layers of the conjunctiva. Silver should be continued until *(a)* swelling and redness of the palpebral conjunctiva have subsided, and *(b)* yellowish-white discharge has yielded to a scanty morning secretion containing no baccilli. From five to fifteen brushings are generally needed to attain these ends. The uneasy sensations associated with catarrhal ophthalmia are mainly due to the accumulated discharges, which act partly as a mechanical and partly as a septic irritant to the conjunctiva. Hence constant removal of secretion is almost as necessary to a speedy cure as it is grateful to the patient. As a wash for general use nothing succeeds better than one-eighth of a grain of corrosive sublimate in an ounce of water, with the addition of one grain of ammonium chloride. The latter increases the solubility of the mercuric salt and prevents the formation of an albumate when the lotion comes into contact with the conjunctiva. This collyrium, previously warmed, may be used from three to eight times a day, and in order that discharge may be thoroughly removed the mucous membrane should be freely exposed by everting the eyelids. Furthermore, it is always well in catarrhal ophthalmia to prevent any adhesion of the lids by means of a little lanolin or other simple ointment introduced into the eyes at bedtime. When the acuter symptoms have subsided silver is to be replaced by some less stimulating eye wash, such as two grains of lapis divinus and 30 minims of laudanum to the ounce of distilled water. Sulphate of zinc or alum lotion (from 1 to 3 grains to the ounce) succeeds well in some instances. I have obtained the most satisfactory results, however, from the old-fashioned yellow lotion of the Austrian Pharmacopœia, which is thus prepared: Ammonium chloride 0.5 part, and zinc sulphate 1.25 parts, dissolved in 200 parts of distilled water. Next camphor 0.4 part is dissolved in 20 parts of absolute alcohol, and 0.1 part of saffron added to it. The two solutions are then mixed, allowed to stand over night, and filtered. The undiluted lotion should be dropped over the everted eyelids twice or thrice a day. It generally gives rise to some smarting when first used, but the patient soon grows accustomed to it. My experiences with formal (1 to 2000) have, upon the whole, been disappointing. It often causes much pain, may excoriate the conjunctiva, and, to my thinking, is inferior in every way to the remedies enumerated above. In a few cases oleaginous preparations seem to suit better than watery solutions, in which event the choice will lie between the yellow oxide and ammoniated mercury. A 2 per cent. to 4 per cent. ointment of either salt is prepared with equal parts of lanolin and vaselin and used twice a day. Whichever may be selected it is important that the remedy be brought into close contact with the conjunctiva. and this is best done by manipulation of the eyelids, or "massage," as it is called. The treatment of every case should be commenced by the administration of a brisk purge, after which a daily evacuation of the bowels should be secured by one or other of the methods in general use. Bandages should be employed exceptionally only. But it goes almost without saying that those with acute catarrhal ophthalmia must shade the eyes from light. They should avoid reading or other close work, live temperately, and spend as much time as possible in the open air. Under proper treatment catarrhal ophthalmia recovers speedily and completely—that is to say, not only does discharge cease, but the palpebral conjunctiva returns to its normal condition. Neglected cases, however, may drag on for months. During the whole of this time more or less secretion continues to be thrown off from the mucous lining of the lids, and since this contains the specific organism, such patients may be a fruitful source of infection to all around. It is, therefore, of the utmost importance that cases be taken in hand early and that treatment be persevered with until cure is complete. In conclusion, let me earnestly insist upon the inadvisability of allowing patients with catarrhal ophthalmia to be associated in the same wards with those affected with the purulent disease or with trachoma."

Holocäin.

DERBY, HASKET, M. D., Boston, Mass. (*N. Y. Med. Journal*, June 19,'97; *From the Boston Medical and Surgical Journal*, June 3, 1897.) In this new agent we have a remedy that is likely to supplant cocain in many cases of ophthalmic surgery, and its advantages are as follows: 1, it does not enlarge the pupil; 2, it does not affect the accommodations; 3, it does not increase the intra-ocular pressure; 4, it promotes antisepsis; 5, it may be used when cocain is contra-indicated.

The author states that holocäin possesses strongly poisonous properties, and that this fact prevents it from being used subcutaneously. It does not contract the blood vessels, and operations done under its influence are likely to be attended by more hemorrhage, than those performed under that of cocain.

Dr. Derby states, that up to the present time holocäin has been under his observation in six operative cases, and in ten others. The operations embraced three extractions of senile cataract, one of a dislocated lens, and one discission. Anæsthesia was rapid and satisfactory in all these cases, the main contrast with cocain being the slight flushing of the eyeball. In one case of trachoma, in which Dr. Standish did expression, anæsthesia did not come on for over seven minutes, but was then complete. In the ten remaining cases holocäin acted as cocain would have done, save that there was no effect on the pupil.

He alludes to the experiments made by Heinz and Schlösser who, he says, have been working with this drug for the past four months. In their experiments, from one to two drops of a 1 per cent. solution generally brought about entire anæsthesia in from forty to fifty seconds. When a second application was made, forty seconds after the first, entire loss of sensation invariably followed in thirty seconds more. The duration of the anæsthesia is at least ten minutes. After the opening of the anterior chamber, a second application was found to affect both iris and ciliary body, an iridectomy in a case of acute iritis causing no pain. This effect on the iris, Dr. Derby says, he too, has observed. He had used holocäin in a simple extraction of senile cataract, but finding it impossible to clear the pupil, he had been obliged to remove a small piece of the iris after the operation had been otherwise completed. No holocäin had been instilled since before the operation, and yet the patient, a nervous and apprehensive woman of 72, had suffered absolutely no pain.

In view of all this, he thinks that with our present knowlege, holocäin is likely to take the place of cocain in ophthalmic surgery, except in cases where subcutaneous injection is required.

On Holocäin in Ophthalmic Surgery.

Carter, Robert Brudenell, F. R. C. S. Eng., London. (*The Lancet*, May 29, 1897.) "A few months ago I recorded in *The Lancet* a trial of eucain as an anæsthetic in ophthalmic surgery, but I found on further use that it was not free from certain disadvantages. The first application to the conjunctiva was apt to be acutely painful, the smarting continuing with some severity for several minutes in some persons, while different specimens of the drug appeared to differ in their power of producing it. I have been told that a modified preparation which has since come into the market, and is sold as "Eucain B," is not painful, but I have no personal experience of its effects.

"On March 27, in the present year, a paper was read before the Belgian Academy of Medicine, by Dr. Deneffe, of Ghent, on a new alkaloid called holocäin, which he described as an effective anæsthetic for ophthalmic purposes, and for which he claimed many advantages over cocain. He said that by applying a drop of 1 per cent. solution to the eye three times, at intervals of fifteen seconds, complete anæsthesia would be established in three minutes without pain, without change in the diameter of the superficial vessels, without dilatation of the pupil, and without paralysis of the accommodation. These results were described as constant. As soon as I read Dr. Deneffe's paper I made an endeavor to procure the holocäin, but there seemed to be none in London. Ultimately, Mr. Rogers, of 327 Oxford street, obtained for me a supply, and last week I was enabled to use it. In the meanwhile, Dr. Gutmann had contributed a paper on the new alkaloid to the *Berliner Klinische Wochenschrift*, and while confirming what had been said by Dr. Deneffe, he mentioned as an additional advantage, that it did not act injuriously upon the corneal epithelium. But he also mentioned that the solution could only be used as an application to the conjunctiva, being actively poisonous if injected under the skin *(die subkutane Injektion zu starke Giftwirkung bedingt)* and that it could not be sterilized in vessels of alkaline glass, as it became turbid when heated in them. He advised that it should only be heated in porcelain vessels.

"I received a supply of holocäin last week, and used a 1 per cent. solution in the manner described by Dr. Deneffe, having first applied some to my own eye and found that it gave no pain. Four applications were made to the patient in the course of a minute; and at the end of four minutes from the first of them, I performed cataract extraction with iridectomy The patient was unconscious of the first incision, and was barely conscious of the iridectomy, not flinching or moving the eye on account of it. The section healed perfectly by the first intention. A day or two later, I used the same solution before slitting up the lachrymal canaliculus, and rendered the little operation absolutely painless. As asserted by Dr. Denffe, there was no action upon either the conjunctival blood vessels, the pupil, or the accommodation; and I cannot but think that the new agent will be found useful in ophthalmic practice. The promptitude of its action is alone of no inconsiderable advantage."

Retro-Ocular Neuritis.

GUNN, MR. MARCUS, London, Eng. (*The Ophthalmic Review*, March, 1897.)

In opening a discussion on this subject at the March meeting of the Ophthalmological Society of the United Kingdom, Mr. Gunn referred the disorder to a group of diseases which, though not recognizable by objective features, had distinct clinical manifestations, and on account of its subjective aspect was liable to be confounded with hysterical amblyopia, particularly when one eye only was affected. An important distinction between the two conditions was furnished by the reaction of the pupil, which was active in the hysterical condition, but sluggish or absent in the nerve affection, there being sometimes failure in maintaining the contraction. Occasionally the optic disc was affected, and in some cases both eyes were involved, but the changes in the disc were never gross. In papilitis the fundus changes preceded the loss of vision, but in retro-ocular neuritis vision failed early in the center of the field, the disc changes occurring later. Vision improved with subsidence of the neuritis,which might be followed by some pallor of the outer half of the disc proportionate to the intensity of the inflammation. It appeared that the swelling in papillitis did not interfere immediately with the transmission of nerve impulses, whereas in deeper seated neuritis it did so immediately, owing to the pressure being exerted centripetally upon the nerve fibers. This he attributed to the resistance of the nerve sheath; he pointed out that the effect was most marked when the portion of the nerve affected lay within the optic foramen, which was quite unyielding. One of the most prominent features of the disease was the presence of a central scotoma, first for color (green-red) and afterward for white, showing that the macular fibers were earliest affected. This might be due to the following facts: (1) The macular fibers, though peripheral at the ocular end of the optic nerve, attain a central position in the optic foramen; (2) the macular fibers, being functionally the most active, may be earliest affected by pressure; (3) the principal lymph current traverses the center of the nerve; (4) the macular fibers occupy a relatively large area in the optic nerve. With regard to the symptoms of retro-ocular neuritis, in one there was subjective sensation of color of a violet or reddish-pink tint, with slight peripheral contraction of the field and a diminution there of perception for green, which assumed a bronze appearance. The movement of the eyeball was painful in one or other direction corresponding with the portion of nerve affected. The degree of amblyopia varied greatly. Acuity of vision was diminished in a bright light or after prolonged use, general fatigue, or exhaustion from want of food. In some cases objects appeared as if seen through a moving haze. These phenomena might be explained by the breaking up of the nerve-sheath, leaving the axis cylinders incompletely insulated, or by the alternating activity of exhausted fibers. In support of this last suggestion it has been found that the colors red and blue are distasteful to the subjects of retro-ocular neuritis. The liability to injury appears to be more marked at the periphery and extreme center of the nerve. The causation of the neuritis may be traced locally to the spread of the change to the nerve from neighboring orbital cellulitis, due to erysipelas, cold or septicæmia; or to periostitis extending to the optic foramen from the adjacent sphenoidal sinuses, in which case both nerves are affected; or the neuritis may be a local manifestation of a general disease, such as syphilis, gout, or rheumatism, the latter having a tendency to recurrence; and, finally, the optic tracts and nerves are liable to suffer as part of the central nervous system as in insular sclerosis.

Notes on the Anatomy, Development, Pathology and Surgery of the Frontal Sinuses.

Collier, Mayo, M. S., F. R. C. S. E., London, Eng. (*The Lancet*, June 12, 1897.)

After giving an account of the anatomy and development of the frontal sinuses, the writer continues:

"In most cases these patients apply for relief to the various ophthalmic institutions. The records of the special hospitals for diseases of the nose and throat are almost blank; but, on the other hand, if anyone examines the reports from the various ophthalmic hospitals he will find many cases recorded of affections of these spaces.

This is accounted for by the fact that the accumulations of fluid, be it pus, serum or mucus, or what not, in 99 cases out of 100, bulge or perforate the roof of the orbit and protrude at its upper and inner angle under the upper eyelid, usually causing diplopia as a prominent, and often to the patient only, symptom. The records of these cases are not a few, and the names of ophthalmic surgeons are invariably associated with them. Hulke, Lawson, Soelberg Wells, Bell Taylor and many others have each reported one or more cases.

"The lining membrane of the frontal sinuses is but an extension of the lining membrane of the nasal cavity through the infundibulum. It differs widely in character from the usual lining membrane. It is extremely thin, and in the healthy state pale in color and intimately adherent to the subjacent periosteum. From these differences in anatomical character it follows that the lining membrane of the frontal sinuses would probably not be subject to the same rôle or list of diseases that characterize the more vascular and complicating lining membrane of the nose proper. By far and away the most common affection in these spaces is catarrh, in one form or another, leading commonly to distension and abscess by the retention and accumulation of the products of inflammation. The pressure of the retained fluid bulges in some cases the bony casement at its weakest point, the roof of the orbit causing displacements and protrusion of the eye. Cases are not unknown where the contents have pressed backward and necrosed the bone, and so entering the arachnoid cavity have set up a fatal meningitis or abscess of the brain. Again, the pus—although rarely—may bulge and perforate the bone in a forward direction. Cases, again, occur where the accumulation is intermittent the pressure due to retention forcing the normal passage into the nose. These latter cases are not marked by a protrusion ito the orbit, and being free from any gross external signs to assist the diagnosis are, as a rule, unrecognized. To this class of cases the term 'latent empyema' of the frontal sinus is, I think, properly applied.

"The diagnosis and treatment of these two classes of cases is radically different. In the former we have to make a diagnosis and differentiate from distended lachrymal sac, dermoid cysts, cellulitis or orbit, exostoses, and new growths. In latent empyema of the frontal sinus the diagnosis to a large extent depends upon subjective symptoms alone. In the one class of cases the first and only symptom may be a displacement of the eyeball associated with diplopia, but unaccompanied with pain or uneasiness at the root of the nose. Latent empyema of the frontal sinus is not necessarily associated with any other affection in the throat or nose. The onset is usually undefined, and patients have merely perceived that from a certain date without well marked cause they began to suffer from pain and uneasiness in the situation of the frontal sinuses (Prof. Ogston). After a while headache at the root of the nose, varying in intensity but always present, is a main feature of these cases. A discharge of pus, not abundant but variable in quantity if looked for, may generally be made out. Pus may also be found at the anterior part of the roof of the cavity, but is small in amount and rareiy visible. Pain or tenderness on pressure may or may not be present, but percussion with the fingers or a plexemeter generally elicits some uneasiness. The pain varies in some degrees, it is constantly present, but is seldom acute or unbearable. Bending forward, stooping, or reading increases the trouble, and as a rule it is increased when in the recumbent position and after sleep. Dull, damp and rainy weather increases the discomfort, but high altitudes and bright and dry atmospheres improve matters considerably. Many of these cases escape diagnosis. and are treated with bromides and iodide of potassium, shower baths, and the usual list of remedies for headaches without material benefit. I have the notes of several cases of latent empyema of one or both frontal sinuses where with symptoms such as related above the diagnosis has been made, and on the sinuses being trephined from the front the lining membrane has been found so granular as almost to constitute a polypoid state. In other cases many actual polypi have been found. These cases have, without exception, in my own hands done well, leaving on the forehead scarcely an indication of the site of the operation.

"In latent empyema of the frontal sinus to reach and effectually treat the disease by way of the infundibulum is, in my experience, practically out of the question. Resort must be had, then. to opening the sinuses in front at the root of the nose in the mid-line, or at the inner and upper angle of the orbit. A strong and fatal objection to this latter procedure being that the empyema may be one-sided, and it is impossible as yet to make sure on which side the disease is located. The procedure requisite to open the frontal sinus from the front is the following: The patient being anæsthetised, preferably with chloroform, and the interval between the eyebrows being divested of any hairs and made scrupulously clean, a note is to be made of the exact spot in the mid-line on a level with the upper margin of the orbits. This, for the purposes of the operation, may be termed the "pin spot," as it is the spot where the pin of the trephine is subsequently placed. An incision should be made exactly in the midline, commencing at the root of the nose below the glabella and carried upward for about two inches. In this incision everything is divided to the bone. There is no hemorrhage as a rule. Next the pericranial covering is raised by an elevator and retracted to each side with blunt hooks or retractors. Bone to the extent of a five shilling piece will now have been exposed. A trephine with a crown the size of a six-penny-piece or less should now be so placed on the glabella that the pin of the trephine enters the bone at the "pin spot." The trephine is worked in the usual way with caution, examining with a fine probe the depth of the incision after every few twists. As it is important to remove the button of bone without lacerating or opening the lining of the sinus great care must be observed during the last few twists of the trephine. The trephine does its work first below and there is always some difficulty in removing the button, the bony septum or arch dividing the sinuses retaining it above. By careful manipulation with an elevator the button of bone is detached, leaving the mucous lining of the sinus intact. This step is important for the following reasons: One or both sinuses may be healthy. The nature and character of the contents is obscured by admixture of blood. There may be no frontal sinus, and the cerebral cavity may be below what is supposed to be the lining membrane of the sinus. One or both sinuses, according to circumstances is, or are, next to be opened with forceps and scissors and examined. Any secretion is to be removed. Any disease of the mucous membrane is to be treated by curetting or chloride of zinc, or both. Any polypi are to be removed, and the stumps treated with caustic, if requisite. Above all things, an opening must be established with the nasal cavity, and a drainage tube inserted and maintained in position. Daily ablutions with antiseptic fluids will keep up a healthy action and assist a cure. The wound is to be accurately joined, the pericranium and pericranial aponeurosis, as well as the skin, being separately and carefully adjusted. The tube may protude from the center of the wound for the first few days for the purposes of irrigation, but subsequently may be shortened or dispensed with entirely.

"The result of this operation is usually immediately beneficial. The patients lose their troublesome symptoms and are permanently relieved. The wound healing by first intention there is no scar or disfigurement, and the line of the incision is scarcely perceptible. The method adopted by ophthalmic surgeons of treating the other and more common class of cases as illustrated by a protrusion and displacement of the eyeball is rarely satisfactory. Lawson, Hulke, and others, have laid down the rules and steps of the operation for opening the frontal sinuses at the upper and inner angle of the orbit at the most prominent point of the swelling with great exactitude. I have adopted this procedure seldom with more than temporary benefit, and never with speedy relief or cure. In this procedure the protrusion in the orbit is attacked and opened at its most prominent point. The incision is made through the orbicularis muscle, suspensory ligament of the eyelid, and often close to the pulley of the superior oblique muscle and in proximity to the lachrymal sac. The opening speedily closes and granulations spring up, impeding the discharges and ultimately hampering the movements of the lids and leaving a nasty scar and much disfigurement of the parts. More than this, during the operation no clear or exact view is obtained of the interior of the sinus or lining membrane. In this operation it is most difficult to find the infundibulum or enlarge the same, if required, from the orbital opening. A drainage tube in the upper eyelid is most annoying to the patient and most unsightly. Experience shows that these cases treated thus go on discharging for years and are not cured. I have long discarded opening the swelling in the orbit. I now always trephine in the front, a little to one side of the mid-line, and treat the case after the method of a latent empyema. Six weeks will usually suffice to cure these cases, if operated on from the front. More rare affections of the frontal sinuses next to accummulations of fluids or pus are exostoses, polypi, and new growths. Exostoses are very rare and are usually of the hard description. There is one specimen in the Hunterian museum, a large one, filling both sinuses and protruding into the nose and orbit. The museum at Cambridge contains another specimen, and a third is to be found at the museum of St. Bartholomew's Hospital. Mackenzie had two small specimens found, I believe, unexpectedly post mortem. Polypus of the frontal sinus of any size or in the form of pedunculated growths is rare, but when occurring is usually associated with the same disease in the nose. Mr. Hulke reported several cases of polypus of the frontal sinus, only one case of which was unassociated with a similar state of things in the nose. These cases generally led to accummulation in the sinuses and were not primarily diagnosed as polypi. New growths are extremely rare, but sarcoma has been reported as presumably originating in these spaces. Of insects in the frontal sinus cases have been reported by Mackenzie and others. One interesting case of foreign body in the frontal sinus was under my own care—the only case of the kind, so far as I am aware, on record. During the exhibition of snuff a quantity was drawn into an unusually patent frontal sinus, and set up the most intense inflammation with great headache, high temperature, and delirium."

The Ocular Complications of Typhoid Fever.

Bull, Charles Stedman, A. M., M. D., of New York. (*The Medical Record*, April 24, 1897.)

The writer states that in most infectious diseases the eye, if affected at all, is involved more frequently in the early stage, or even in the prodromal period, but that this is not so in typhoid fever, and that this fact sometimes helps to a diagnosis, as in doubtful cases of measles. "In typhoid fever the occurrence of eye symptoms seems to be either a part of the infectious disease itself or among its sequelæ." He mentions retinal hemorrhages as one of the conditions occurring in severe forms of typhoid fever, and dependent upon degeneration of the walls of the blood veesels.

"In typhoid fever various lesions may occur in the eye, not only during the height of the disease, but also during the period of convalescence. These lesions may be enumerated as follows, in the order of frequency:

1. *Conjunctivitis* of the catarrhal type, with little or no

secretion, is a very common occurrence in typhoid, as it is in all fevers." * * *

2. *Phlyctenular Conjunctivitis and Keratitis.* These are not uncommon and occur as clear, transparent vesicles, usually along the corneal margin. There is a great tendency to these affections during convalescence. These phlyctenulæ do not suppurate, but ulcerate, discharge clear contents, and then dry up and leave no trace behind them.

3. *Loss of Accommodation and Dilatation.* These are by no means infrequent symptoms of typhoid fever, are due more to the general asthenic condition than to any lesion in the ciliary body or iris, and occur during the height of the disease as well as during the period of convalescence.

4. *Retinal hemorrhages* of various kinds, and more or less profuse, are by no means uncommon occurrences in the height of the disease, being met with in bad cases and usually accompanied or preceded by interstinal hemorrhage. Ordinarily these hemorrhages are punctate, linear or flame-shaped, occupying the inner layers of the retina and occurring during the third week. Profuse hemorrhages are uncommon. "Sometimes a profuse interstinal hemorrhage will cause amaurosis from the great loss of blood, without there being any retinal hemorrhage. This is due to the general peripheral anæmia and contraction of the arterial walls, caused by the loss of blood, and is of the same nature as the amaurosis met with after profuse epistaxis or menorrhagia. Should these patients recover, the blindness is apt to end in atrophy of the optic nerve."

5. *Paralysis of external muscles* is not infrequent during convalescence from typhoid fever, or at a later period. According to some authorities these paralysis are due to a chronic nephritis, which is a not infrequent sequel of typhoid. They are said to be nuclear, rapidly recovered from, but tending frequently to relapse. Other authorities regard them as due directly to a neuritis caused by the typhoid poison.

6. *Neuro-retinitis, or retrobulbar neuritis,* a rather rare complication and supposed to be due to a more or less circumscribed meningitis at the base of the brain; it is apt to end in atrophy of the optic nerve. The ophthalmoscopic picture resembles that of retrobulbar neuritis due to excessive use of tobacco or alcohol.

7. *Inflammations of the uveal tract*, such as iritis, cyclitis and choroiditis, both serous and plastic, never purulent, are occasionally met with during the height of the disease. They may be unilateral or bilateral, and of varying intensity.

Cataract and Its Association with the Gouty and Rheumatic Diathesis, and Their Relation to Diseases of the Eye.

RISLEY, S. D., M. D., Philadelphia. Pa. (*University Medical Magazine*, June, 1897.)

"It is not difficult to trace a distinct clinical relationship between a large group of ocular affections and the lithic acid diathesis. The eye symptoms from which many persons suffer disappear promptly under out-of-door life, with the attending muscular exertion, deeper breathing, and increased excretion. The blood vessels and tissues are relieved by these means of the products of imperfect metabolism consequent upon sedentary life and the over-supply of rich foods. As a result, not only does the general health improve, but the eye symptoms disappear. While the relation of these ocular discomforts to the milder or incipient forms of lithemia is too frequently overlooked, I believe it is quite as common to neglect the important bearing this diathesis has upon the serious affections of the eye which occur especially during and after middle life. * * *

"It is unquestionably true that opacity of the lens frequently occurs where we can discover no trace of the rheumatic or gouty diathesis in the individual or his ancestry; but I have been at pains to show that even in these individuals the incipient cataract was so uniformly preceded by retino-choroidal disease and vitreous degeneration as to enforce the opinion that the opacity of the lens was a result of impaired nutrition, caused by the associated affections of the uveal tract. In sixty consecutive cases of incipient cataract between 42 and 82 years of age, occurring in private practice, it was shown that in upward of 50 per cent. there was noted a clear history of weak eyes and long-standing asthenopia, often reaching back into early life. Choroiditis in varying degrees of severity, with vitreous opacities, is noted, and in most instances carefully described in one or both eyes in 60 per cent. of the cases, In the remaining 40 per cent. no note is made of the intra-ocular conditions, or the opacity was too far advanced to permit ophthalmscopic study of the fundus, but in many cases of these the intra-ocular disease was rendered probable by the weak and irritable eyes, asthenopia and the chronically injected or inflamed extra-ocular membranes—that is to say, there was present undue sensitiveness to light, headache and increased lachrymation. The conjunctiva of the lids was injected, the caruncles swollen and red, while the episcleral and anterior perforating vessels were full and tortuous, indicating unmistakably the pathological processes progressing within the eyeball. In a word, in these sixty cases of incipient cataract applying consecutively for relief, and presenting all stages of advancement in one or both eyes, there could be no doubt as to the relation of cause and effect between the advancing opacity of the lens and the attending pathological conditions of the uvea.

"That the lens and vitreous body should undergo degenerative changes in an eye the subject of pathologic processes affecting its food-bearing membrane should not cause surprise, since it should be anticipated that these avascular structures would quite naturally be the first to suffer from impaired nutrition. We are accustomed to witness opacity of the lens as a sequel to violent forms of disease involving the uveal tract, as in plastic irido-cyclitis, detachment of the retina, and absolute glaucoma, in all of which it is very liable to occur as the closing scene in these destructive processes.

"That less vicious forms of uveal disease may also be influential in leading to impairment of the nutrition of the lens and causing it to become opaque and that the gouty and rheumatic diathesis are among the most frequent causes of these chronic subacute forms of disease affecting the uvea is the contention of this paper. I suppose that no one will be found to question the clinical fact that these important dyscrasiæ are second only to syphilis in causing iritis and irido-cyclitis, especially in their recurrent forms. But any careful study of individual cases will reveal the fact that the entire choroidal tract is more or less seriously involved in every case. Indeed, it not infrequently happens that the acute recurrences of iritis are preceded by a lighting up of the deeper chronic and progressive chorioditis under exacerbations of the rheumatic or gouty diathesis. That many of these exacerbations never result in iritis, but are manifested by asthenopia, slightly increased impairment of vision, and tender eyeballs is doubtless true, each attack disturbing more and more profoundly the nutrition of the eyeball. Such attacks are often attended with transient increase of tension, a steamy cornea, and foggy vitreous body. When examined with a magnifying glass this want of transparency in the vitreous is seen to be due to a fine granular or sand-like deposit, which clears up as the attack passes off. Under repeated exacerbations web-like opacities finally form which float more and more freely as the vitreous degenerates and loses its normal consistency. The nucleus of the lens becomes more and more plainly outlined and the lens substance more strongly reflecting. In many cases banks of opacity form in the periphery from which spicules of opacity sooner or later project along the capsule toward the pole."

The writer gives the detailed history of a case which he has kept under observation for the past thirteen years; in this case, cataract was but one of the phenomena in a long chain of symptoms depending upon the diathesis under discussion. This patient had recurring attacks of headache, during which she was unable to use her eyes; there was foggy vision, tenderness, lachrymation, photophobia; examination showed incipient cataract, choroiditis and fine opacities of the vitreous. There was a gouty history. She has now a rapidly maturing cataract and this state, the writer thinks, has been reached by frequently recurring exacerbations of mild gouty attacks. Many times the eyes have escaped, the attacks falling upon the joints, but frequently the eyes alone suffered, sometimes one, but often both at a time.

"That the nutrition of the lens should suffer in the presence of this diathesis is rendered at least probable by several consderations other than those already adduced. It is, in the first place, to be expected that what may be termed the unstable equilibrium of the component transparent cells of the lens would be readily disturbed, as others have pointed out, by quantative change in its environing fluids. For example, it is well known that the entrance into the tissues of the frog of rapidly diffusible substances, as chloride of sodium, naphthalin, and sugar, disturb the transparency of the lens, presumably through some change in the normal osmotic qualities of the fluids in and around the lens. I have, in three instances, seen curious and interesting changes suddenly occur in the refraction of diabetic patients during acute exacerbations of their disease, presumably due to changes in the lens, which once more resumes its normal state when the great excess of sugar had disappeared from the urine, and presumably also from the tissues.

"It is probable, having these observations in view, that the change in the density of the tissue fluids was sufficient to disturb the physiological relation of osmosis in the lens fibers, and thus lead to the observed changes in the refraction of the eye. If this can occur in saccharine diabetes, why may not a similar change be produced by the accumulation in the blood and fluids of the tissues of lithic acid and its salts. While the lens may recover from a single disturbance, as noted in the two cases of diabetes mentioned above, it is highly probable that permanent degeneration would ensue upon repeated exacerbations, or if the lens were steadily bathed in an abnormal nutritive fluid. The excess of uric acid salts in the serum in the rheumatic or gouty diathesis may be, and doubtless is, sufficient to disturb the nutritive equilibrium in all the organic cells, but would fall with especially disastrous results on the unstable transparent cells of the lens and vitreous body. The amount of uric acid in the gouty blood may, according to Gerrod, reach .11 grain in 1000 grains of serum. Furthermore, it is a significant clinical fact, as bearing upon the conclusion of this paper, that the ectodermic structures of which the lens is one, and the connective tissue in and about the joints where it is most dense and comparatively avascular, and, therefore, where nutrition is most easily retarded, are precisely the localities which suffer earliest and most constantly in the evolution of gout."

Taxis in Increased Intra-Ocular Tension.

RICHEY, S. O., M. D., Washington, D. C. (Journal of the Amer. Med. Assoc., May 29, 1897.) "The principal arteries of the globe enter it posterially and pierce the sclerotic directly, limiting as far as possible resistance to the access of nutrient blood. On the other hand, the veins pass very obliquely through the sclerotic in channels varying from 1.5 mm. to 5.5 mm. in length, and contain no valves distal to their junction with the ophthalmic vein. The intra-ocular vessels have no vaso-motor constrictors, and the tension of the eyeball depends upon the pressure in the extra-ocula arterial current; after death it is lowered. Given an abnormal propulsive force in the extra-ocular arterial current from any cause, and the increased influx of arterial blood raises intra-ocular pressure. So long as this influx does not exceed the ability of the venous system to remove it, the increased tension is within the limits of safety; but should there be any slowing of the outflow of venous blood, that is, a loss of balance between the influx and the efflux of blood, 'a vicious circle' is at once formed, which is more or less able to break itself, depending upon the less or greater violence and persistence of the general vascular excitement.

"Unfortunately, from this point of view, the anatomic course through the sclerotic of the veins favors obstruction to the outflow of venous blood, they for a limited part of their length being parallel with the sclerotic and within its meshes; so that *any* increase of pressure within the eye must narrow their lumen and diminish the outflow. This in turn adds to the existing intra-ocular pressure, further reducing the caliber of the veins, and resulting in edema of the surrounding tissues, carrying a false impression that glaucoma is due to a disturbance of intra-ocular secretions. Venous stasis in chronic glaucoma if not relieved, results in thrombosis and connective tissue hyperplasia, in addition to other recognized changes. The difficulties and uncertainties arising in the hisiory and management of chronic glaucoma have their immediate cause in thrombosis of the choroidal veins, complete relief from which depends upon the length of time it has lasted, and the more or less permanency of the changes within the vessels from the presence of coagula, for organized tissue may have formed there, with final abolition of the vessels of which no mitigation is possible.

"Previous to organization of the coagula and obliteration of the vein, during stasis and even when thrombosis is recent, the flow of venous blood is favored, or the coagula may be broken up, passed into the larger vessels and redissolved by pressure upon the external surface of the eyeball in imitation of the normal interrupted pressure upon it of the eyelids, of the extrinsic muscles and their tendons, and that produced by the contraction of the iris, which here, as elsewhere, promotes the movement outward of the current within the veins, and is antagonistic to stasis. This proceeding I suggested and described at the meeting in 1896 of the American Ophthalmological Society, under the name of *taxis*, because the movement of the fingers is the same as in reducing hernia. It is an imitation of a normal function adjusted to a condition of normal tension, and is necessary because this function of the lids and muscles requires aid in a state of high intra-ocular tension, which offers increased resistance to pressure. It should be cautiously practised when the coats of the vessels are weak, to guard against intra-ocular hemorrhage, the risk of which is small, except when hemorrhage is imminent or has previously occurred. It will accomplish what may be achieved by operation, with the advantage that it may be repeated with the recurrence of venous stasis and increased tension, which is a chronic tendency in chronic glaucoma.

"That a myotic stimulates the iris to the production of this kind of pressure; that a mydriatic favors an attack of glaucoma by paralysis of the iris, thus allowing an advance of vitreous body and lens, and consequent increased intra-ocular engorgement and obstruction of the anterior channel of filtration; that iridectomy, the force of the extra-ocular circulation being lessened, acts by temporarily relieving pressure upon the surface of the veins, permitting them to disgorge themselves; that after iridectomy, malignant glaucoma, intra-ocular hemorrhage and failure of the anterior chamber to reform, are caused by the persistence of undue *vis a tergo* in the extra-ocular arterial system, I am convinced.

"This paper is an appeal to my colleagues to transfer their attention in glaucoma from the anterior channels of filtration to the fundus; from the relative amounts of secretion and excretion of the fluids of the eye to the influence of the vascular system, local and general; from a possible vicious circle in the anterior to a more rational vicious circle in the posterior section of the eyeball; satisfied that only thus will they find an acceptable solution of the many perplexing phenomena which have been observed in glaucoma."

Sarcoma of the Corneal Limbus.

STROUSE, A. N., M. D., New York (*Archives of Ophthalmology*, April, 1897.) The writer relates the history of a case of this disease, speaks of the origin of these neoplasms, the symptoms, pathology and treatment, gives a list of the cases previously reported and concludes with the following summary: 1, Sarcoma of the limbus is of comparatively rare occurrence; 2, it never invades the interior of the eyeball, but remains confined to the external structures; 3, metastasis practically never occur; 4, recurrences are frequent, but do not contra-indicate conservative measures in treatment; 5, radical procedures, enucleation or exenteration, are unjustifiable, except in those cases in which the growth has attained extensive proportions, or in which vision has been destroyed.

Law of Refraction—Change Following Increase or Decrease of Body—Weight.

GOULD, GEORGE M., M. D., Philadelphia, Pa. (*The Medical News*, June 26, 1897.) "In starvation, 97 per cent. of the fat of the body is lost before death, and of the remaining 3 per cent. the orbits always retain some and a larger amount proportionally than other localities. This seems to indicate that the cushion of fat blanketing the eyeball posteriorily is of great importance to the function of vision, and if so, it would appear natural that great increase or decrease of body-weight, consisting mostly in gain or loss of fat, might lead to changes of fat deposits in the orbit, with consequent variations in pressure upon the eyeball. If to this consideration we add the noteworthy fact that a variation so small as that of one millimeter in the antero-posterior diameter of the eyeball produces the huge ametropic change of three diopters, we recognize how slight a difference in orbital pressure is required to account for a marked variation of refractive error. It is easily demonstrable that a difference of one or two diopters may be produced simply by increase or decrease of posterior pressure, without posterior staphyloma, or in any way altering the total capacity of the eyeball, but simply by altering its shape. The equatorial diameter would be lengthened by a slight polar shortening, and *vice versa*. The ametropia of albinotic eyes shows this fact produced by another mechanism.

"These purely *a priori* thoughts had been in mind for years, and I had had a number of patients in whom changes of refraction were suspected to be coincident or consequent upon changes in body-weight, but there were always some elements of doubt, due to the fact that as the patients had been previously examined by other oculists, I might reasonally suspect there were errors due to my own carelessness, etc. Last spring, however, several cases came nearly together, and a study of the case-records appeared to warrant a tentative theory, or working hypothesis, of sufficient plausibility to justify making the suggestion public. I remember to have been often perplexed before the present suggestion occurred to me to account for decreases in myopia. I by no means claim any great definiteness of result or any precise formulation of a law, except in general terms, and liable to modifications and exceptions. I myself have had one or two cases showing that, if founded upon fact, the rule is not variable. It certainly could not be so, because many complicating conditions and circumstances must occur, and must be taken into account. With all due allowances and justifiable cautions, it seems to me that the thought is a reasonable one, and is given in order to be proved or disproved by the future observations of many. If it is true, it will help to explain a number of perplexing cases, and put us and our patients on guard. I am sure the common belief that myopia does not lessen is frequently disproved by facts. It has for years been my custom to expect refraction changes consequent upon severe general illness, and it may be that these are, at least in part, mere corolaries of the theory under consideration.

"In brief, my suggestion is as follows: Great increase of body-weight may cause shortening of the anterio-posterior diameter of the eyeball or alterations of curvature (increase of hyperopia, decrease of myopia, or similar changes of astigmatism); and on the other hand, great decrease of body-weight may be coincident with lengthening of the eyeball (decrease of hyperopia, increase of myopia, or like changes of astigmatism.)" The writer adds a few cases which clinically illustrate the law, and says in conclusion: "It is also possible that changes in muscle-balance may sometimes depend upon the amount of fat in the orbits and lids. An indirect but striking proof of the theory set forth, consists in the fact of the production of high degrees of compound hyperopic astigmatism in albinos due to the continuous lid-pressure. The albino seeks to shut out light by the lids, and the pressure lessens the anterio–posterior diameter of the cornea and shortens the vertical meridian to an enormous degree."

Conical Astigmatism, and Staphylomata of the Sclerotic as a Cause of Astigmatism.

BATTEN, RAYNER D., M. D., B. S., London. (*The Ophthalmic Review*, January, 1897.) The writer calls attention to the diagnosis of staphylomata occurring laterally, or in the anterior portion of the globe. "Staphylomata or general yielding of the globe anteriorily do not necessarily give rise to the evidences usually associated with yielding of the sclerotic, viz., refractive myopia, myopic crescents, thinning of the choroid, stretching and distortion of the retinal vessels. Yielding of the sclerotic in the anterior portion of the globe can be frequently well seen by simple examination of such portion of the external surface as can be rendered visible by retraction of the lids, combined with extreme lateral and vertical movements of the eye, which will also reveal any distortion of the globe, either by a localized staphyloma, or by lateral yielding of the sclerotic. The thinning of the sclerotic can be detected by its bluish color and its greater translucency to focal light. In many cases of high astigmatism, the lateral yielding of the sclerotic is extremely well marked, giving rise to a flattened appearance at the upper portion of the globe, and a distinct thinning at the external side.

"Astigmatism has of course been abundantly proved to be directly caused by differences of curvature of the cornea. But this distortion of the cornea is, I believe, generally secondary to the yielding of the sclerotic at some other portion of the globe. In a more or less elastic sphere, such as the eyeball, dependent in part for its shape on internal pressure, distortion of any one portion of the globe cannot take place without affecting the shape of the rest of the globe. Consequently, if the sclerotic yields laterally, the curvature of the cornea becomes flattened in that direction, and when from any cause a portion of the globe becomes softened and yields, it not only forms a cone at that spot, but the rest of the globe in the immediate neighborhood also becomes more or less conical, and the whole globe becomes egg-shaped, with the little end at the point of greatest yielding. This is typically seen in cases of conical corneæ, but it also occurs in other forms of staphylomata, occuring at any portion of the globe. * * * The condition is by no means a common one, and its importance lies chiefly in the light which it throws upon the causation of some other forms of astigmatism. It shows that a yielding of the sclerotic affects the curvature of the cornea, and in many cases of high simple or mixed astigmatism I have found the lateral portion of the sclerotic considerably stretched and thinned, and on ophthalmoscopic examination that portion of the fundus proves to be more highly myopic than the rest of the fundus.

"In some cases where there is evidence of old corneal mischief, the astigmatism is irregular, and the shadows assume somewhat the same triangular arrangement as in cases of corneal astigmatism, though probably due to another cause. In cases of conical astigmatism, the cornea is clear and the retinoscopy shadows are distinct and definite.

"In conclusion, the points I wish to explain are (1) that in most cases of astigmatism, there is evidence of yielding of the sclerotic at some portion of the globe, and the corneal astigmatism is secondary; (2) that when astigmatism is very high, the yielding of the sclerotic is chiefly lateral and localized; (3) that in cases of conical astigmatism, a staphyloma is to be found in the immediate neighborhood of the cornea."

Magnifying Lenses for Use When Operating.

JACKSON, EDWARD, A. M., M. D., Philadelphia, Pa. (*Archives of Ophthalm.*, April, 1897.) "Probably all ophthalmic surgeons have, at some time, thought of the use of strong convex lenses to assist in operating. To those who have reached that stage of maturity that brings presbyopia, something of the kind is a necessity, and for those who have not reached that maturity, a trial of the possible advantages to be gained by working with magnified images may have occupied time spent in waiting for practice.

"The easy and natural attempt in this direction is made by putting a pair of strong convex lenses in a trial frame. But working with such an arrangement, or with a pair of such lenses permanently mounted in spectacle or eyeglass frames, has proven unsatisfactory. It shuts off distant vision beyond a certain distance, except by twisting the head to look over or under, or to one side of the glasses, and does not give sufficient magnifying power to be worth the difficulties and discomforts encountered, without bringing the surgeon's eyes too close to the eye he is operating upon.

"Another method, free from most of these objections, but presenting certain others, has been to employ a strong magnifying lens, held close to the eye to be operated upon. The difficulties with this are: It sacrifices binocular vision, and the holding of it must be entrusted to an assistant, or to some special support which may not sustain it in the best position just at the critical moment; or to obviate this it has been attached to a broad ring on one of the fingers of the operator. But this last arrangement limits the movements and usefulness for other purposes of the hand, and entails an additional effort of co-ordination at the time that the operator wishes to concentrate his whole attention upon the seat of operation.

"The instrument herewith presented is designed to give the advantages of considerable magnification of the seat of operation, without the disadvantages that have rendered other attempts in this direction unsatisfactory and of little practical value. The instrument here shown consists of the binocular lenses that I have elsewhere described (transactions of the American Ophthalmological Society, 1896, p. 742), modified to suit the particular requirements of this use, and supported by a head-band, such as is used to support the mirror for illuminating the nose and throat.

"In the first place, the lenses being supported by a rigid connection with the head are perfectly controlled by the surgeon through movements of the head, movements habitually co-ordinated with the use of the eyes and executed unconsciously without in any way disturbing his attention.

"Secondly, binocular vision is secured, and its value greatly increased by the combination of lenses employed, and with no greater effort of accommodation or convergence than is required in operating under the most favorable conditions without magnifying apparatus, and with no disturbance of the normal relaxation of accommodation to convergence.

"Thirdly, the field of vision is not interfered with. The surgeon can look above or below, or to the right or the left of the instrument, without inconvenience.

"Fourthly, the full advantage of magnification is obtained without at all sacrificing convenience by bringing the surgeon's eyes too close to the eye he is operating on. In illustration of this last point, suppose one wished to get the magnifying power of a 3-inch lens, placed in spectacle frames close in front of his eyes. To do this, he would have to bring his face to about three inches from the eye operated on. With the form of instrument I have used the operator's eyes are six inches from the eye operated on; and it is possible to get ten or twelve inches, or any greater distance, without sacrificing the magnifying power, by lengthening the bars carrying the lenses. However, I have found six inches quite a satisfactory distance, and probably no one will find more than eight or ten inches desirable.

"The proportions and dimensions that seem best are as follows: Each tube 20 mm. long, the lens at the lower end 13 D., the prism at the upper end 15 centrads (refracting power, or degrees refracting angle), the tubes making with each other an angle of 40 degrees, the upper ends with the centers 45 mm. apart.

"Before venturing to present the subject, I have had the instrument in actual use for some months, and have found it of more practical value than theoretical considerations had led me to expect. It has been employed in extraction of foreign bodies, curetting corneal ulcers, iridectomies, discissions for soft and secondary cataracts, curetting the lens for traumatic cataract, and cataract extraction with or without iridectomy. It is for operations similar to these that it will probably prove most useful.

"There is no difficulty in employing it where one has become accustomed to it. It should be put on and completely adjusted to its proper position, in front of the eyes, before the final cleansing of the hands prior to operation. In so far as it gives a magnified image, a good light on the seat of the operation becomes of greater value.

"The difficulties of learning to see through it are not very serious. Chiefly these are in the direction of mistaken judgment as to the extent of the incisions made, or of the part removed; for instance, it is difficult to realize that you have not extracted the whole crystalline lens, when perhaps only $\frac{1}{4}$ or $\frac{1}{3}$ of it has emerged from the corneal wound. Unless on his guard the operator might make a smaller incision than he intended, without at once recognizing his error. Such difficulties may, however, be overcome without having to encounter them often in operations by simply employing the lens habitually to inspect the eye by oblique illumination."

ABSTRACTS FROM RECENT FRENCH AND ITALIAN OPHTHALMIC LITERATURE.

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Quarter Ending July 1, 1897.

Serous Cyst of the Slerotic.—Persistence of Binocular Vision in Hysterical Amblyopia.—Danger of Intra-Venous Injections of Mercurial Salts.—Retinal Hemorrhage in Leukemia. Anatomo-Pathology of Congenital Specific Choroiditis.—Electrolysis in Lachrymal Strictures.—Carcinoma of the Iris.—Treatment of Hemorrhage after Extraction by Suture. Visual Disturbances in Tumors of the Chiasma—Exophthalmic Goiter.

Serous Cyst of the Sclerotic.

Rogman. (*Annales d' Oculistique*, February, 1897.)

Anna N., aet 3, tumor of left eye; present since birth, and increasing in size. No history of disease or injury. Tumor is bilobate, 8 mm. long, extending from 1½ mm. above the horizontal to within 2 or 3 mm. of the vertical diameter of the cornea, along the limbus conjunctiva in its lower nasal quadrant, encroaching slightly on the transparent cornea, and of almost the same color as the sclerotic. From the edge of its upper and inner portion a large superficial conjunctival vessel extended toward the inner canthus. By focal illumination it appeared semitransparent. It is firmly adherent to the sclerotic, and on compression the wall yields and becomes slightly hollowed. Anterior chamber normal. Iris normal in appearance and action. Pupil round, central and of same size as that of the other eye. Cornea presents a leucoma 1 mm. wide, corresponding to length and position of the tumor, and extending for that distance into the transparent cornea. Media clear and fundus normal, as is also the tension. For diagnostic purposes the tumor was punctured with a discission needle, a clear, colorless, serous liquid escaped and the tumor, as it collapsed, took on throughout its whole length a blood-red color. Neither the anterior chamber nor the ocular tension was affected. The cystic nature of the tumor and its relations having been as accurately determined as possible, 14 days afterward the anterior wall of the cyst, which had reformed, was removed. After puncture with a narrow knife, carried flat upon the adjacent conjuntiva, one blade of a blunt pair of scissors curved on the flat was introduced, and the anterior wall of the cyst removed as close to the surface of the eyeball as possible. As before, only a colorless, limpid fluid escaped, no blood or hairs. The posterior wall of the cavity was quite smooth; the anterior wall formed by the posterior surface of the membrane just removed, and which, being stiff, preserved its form, had folds. The posterior wall presented a uniform dark gray color, except at a point corresponding to the center of the large lobe of the tumor, where it was almost black. Recovery normal; cicatricization had taken place by the gliding of the conjunctiva over the sclerotic, the configuration of which was perfect and no ectasia. One year later refraction was determined: — 1.00 sph. ○ 3.00 cyl. ax. 160°; the axis slightly above the middle of the cicatrix.

Histological examination of anterior wall of the cyst, which was hardened in Müller's fluid, stained with hæmatoxylin and eosin and imbedded in celloidin.

On its conjunctival surface is a layer of epithelial cells characteristic of the conjunctiva; immediately beneath this are large bundles of connective tissue fibers, mixed with numerous elastic fibers, all parallel to the surface. In places we note traces of interstitial hemorrhages, evidenced by numerous blood corpuscles around the vessels in the meshes of the tissues. These hemorrhages were probably the result of the exploratory puncture and the lowering of the pressure to which the vessels had been subjected by the removal of the anterior wall of the cyst. They also explained the sudden assumption by the tumor wall of the red color above noted. On the opposite surface no epithelial elements were discovered, notwithstanding a most careful search.

The following considerations point to its being a cyst of the sclerotic:

1. The structure of the membrane. The vascularization

is explained by the irritation produced by the distension; excessive development of the vascular system of the sclerotic being met with in similar cases.

2. Relations of the cyst with the deeper structures. The posterior wall or bottom of the cyst was formed by a thin gray pigmented layer of sclerotic, showing through its transparency the ciliary body underneath, and limited on one side by the border of the cornea and on the other by a border of normal sclerotic. The sclerotic had evidently been separated into two layers, one with the conjunctiva forming the anterior and the other the posterior wall of the cyst. But six cases of cysts of the sclerotic have been reported with details. Von Hasner reports having seen several cases, but gives no details.

De Wecker does not think that cysts ever develop in the sclerotic itself, and Fuchs and Knies think they do so only rarely.

The following theories as to the origin of sclerotic cysts have been propounded:

1. Waldhauer and Stellwag think they are a dilatation of the canal of Schlemm.

2. Von Hasner thinks they are encysted choroidal exudates, with consequent staphyloma of the sclerotic—episcleral cysts.

3. The author thinks they are local hydrops of the sclerotic, produced by a congenital fistula from the anterior chamber into the sclerotic, which is afterward closed, but through which until its closure the aqueous humor finds its way between the lamellæ of the sclerotic. This he thinks probable, because the anterior chamber is normal, the iris regular in contour and the irido-corneal angle well formed.

Persistence of Binocular Vision in Hysterical Monocular Amblyopia.

Dor, Louis. (*Revue Generale d' Ophthalmologie*, February, 1897.)

Dor reports a case of a girl, aet 19, who noticed, accidentally, that on closing the right eye she could not recognize people across the street with her left eye. She could not tell how long this condition had existed, but remembered that as a child she had seen well with both eyes. Her family history is good; no constitutional taint of any description in either branch. She had measles and tonsillitis, but not diphtheria nor any other infectious disease.

Menses regular, except upon one or two occasions, when the flow was excessive. Patient is of a pious temperament, but sometimes has disagreeable temper, is sulky, morose and melancholic, but never has had nervous prostration. Present condition: Pupils react normally to light and accommodation. Fundus and media are normal.

R. V: 6 and finest print of De Wecker and Masselon.
L. V: 1 and No. 8 print of De Wecker and Masselon.
Retinoscopy: R. + 75 sphere.
L. + 1.75 sphere ⊃ 1. cyl. ax. 90°.
Accommodation in R. Eye of normal amplitude: in L. only 5 diopters.

Field for white slightly contracted. There is a central scotoma. At the distance at which patient recognized with the right eye. blue and violet objects of 1 mm. diameter she only recognized red and green objects of 3 mm., blue and yellow objects of 5 mm.. and violet objects of 6 mm. diameter. Patient said that all the objects looked at with the left eye appeared at first of the same size as when looked at with the right eye, but after one or two seconds they began to grow smaller and smaller until they seemed to be but two-thirds their real size. This micropsia was sufficiently characteristic to lead me to the diagnosis of hysterical amblyopia, although clearly defined hemianæsthesia could not be demonstrated, but only a general dysæsthesia. Cold douches were prescribed, but with an unfavorable effect; vision RV. = ·2, while LV. remained as before. Gastric disturbances were then treated without improvement or apparent effect upon the sight for two months. Electricity was then tried, and at the end of several seances vision improved until Rv. = 8 and Lv. = 4, and patient could read De Wecker No. 5 at 20 cm. The central scotoma had diminished, but the field of blue and violet was somewhat contracted.

With the stereoscope patient read with both eyes successively types L. 5, L. 4, L. 3, L. 2, without hesitation and fluently. It appeared to me that she saw more than she read with the left eye; and, although I had not then read what had been written on the persistence of binocular vision in hysterical monocular amblyopia, I could not bring myself to consider my patient a malingerer. On being asked to close the right eye and read with the left what she could of the letters of the last type which she had read with both eyes, patient said she saw them for a moment, but that the micropsia immediately appeared and that it was impossible for her to see the letters. It was evidently a case of monocular amblyopia of the left eye, but with the stereoscope the patient read as well with one eye as the other. In a week, after repeating at home the tests to which she had been subjected by me, she returned with exactly opposite symptoms; *i. e.*, vision had become almost normal in the left eye and quite so in the right eye, but she had lost binocular vision and could only alternately see with the right or left eye.

Can we suppose that there is a center for binoular vision and one for monocular vision of each eye, and that they act separately? When facts like those of the case above cited have been observed in cases of cerebral lesions and verified at the autopsy, it will be time enough to accept these hypothesis. At present it is sufficient to conclude that hysterical patients simulate without being conscious of it; that in many cases true amblyopia does exist, since patients are not conscious that they see, and we must not confound them with malingerers who lie. These are simulators who do not lie. In such cases as the above it must be admitted that there is sometimes very great difficulty in distinguishing hysterical from simulated amblyopia, and we must not be in too great a hurry to reach the diagnosis of malingering.

A Word on the Danger of Intra-Venous Injections of Mercurial Salts.

BACELLI (*Rec. d' Ophth.*, Dec., 1896,) has introduced in Italy a new method of treatment in certain syphilitic affections, by means of intra-venous injections of the mercurial salts. It is recommended more specially in grave cases, above all in cases which do not tolerate the mercurial preparations when taken through the stomach, or when the case is a fulminant one, demanding prompt attention.

Let us see what advantage there is in following this course of treatment, and what are the favorite preparations used by its advocator.

Darver and Bacelli recommended the sublimate, the peptonate in rather small doses, and the cyanide of mercury.

Dr. Jehin Prume, in his last exhaustive work, speaks very highly of the cyanide, notably in the treatment of choroiditis and optic neuritis of syphilitic origin, and in all cases where an anti-venereal treatment is called for without delay.

The author claims for it an advantage over other methods, and also that the injections are free from unpleasant symptoms and danger.

His maximum dose for adult being 1 centigramme, which he reaches gradually by means of a graduated glass syringe. For a while, an injection is given every other day, then later on every third day, then every fourth day, until a whole week passes between each injection. The injection should be made in superficial veins, those of the arm in preference; care should be taken not to inject in the cellular tissues which surround the vessels. The action is rapid and efficacious, so that after 10 to 15 injections any fundus trouble, even the gravest, will be stopped and cured if taken in time. Such affirmations would be very apt to lead any one into error if they looked upon them as undisputed facts. But I wish to say here, that intra-venous injections are not as free from danger as Dr. Jehin Prume would have you believe, and that stomatitis, salivation, and other gastro-intestinal troubles are met frequently enough, particularly in individuals suffering from chlorosis, anemia, scrofula, and those belonging to the lymphatic group. During the séance of the Société Francaise, May 8, 1895, Dr. Paresitti, (of Rome) denied the dangers spoken of when the technique was faultless.

This is not my view on the subject, and in my hands this method has proven, not only unreliable as to its action, but dangerous to the patient.

The injection of the cyanide, even when in solution of artificial serum, as used by Dr. Darier, is not exempt from complications, local or remote.

The solution used cannot alone be attacked to account for the erysipelas or phlegmonous inflammations which follows, but the traumatism done to the tissues of the vein is largely accountable for it.

The following case will, perhaps, prove better than any other argument the gravity of the accidents which have followed intra-venous injection.

M. G., age 52, is suffering from ocular trouble of a syphilitic nature; R. E. shows that an iridectomy has been performed; the existing cataract is the result of the extensive changes in the choroid; there is no light perception.

L. E. is also the seat of a disseminated atrophic retino-choroiditis with large exudative and pigment spots. The patient has been treated by means of intra-venous injection for eight months without benefit or bad result. In January, 1895, the treatment was renewed, but very soon followed by an erysipelas and a severe inflammation of the right arm, which endangered for several weeks the life of the patient. At the present time the vision is growing worse and the treatment used is that of inunctions (2 grammes of Petit's mercurial preparation).

The second danger is that of producing a coagulum in the blood current, for we know how easily venous blood does coagulate, resulting in embolism or thrombosis in some part of the vascular system. Such complications cannot be looked upon as slight, and certainly are much more serious than any syphilitic disorder.

My last objection to the use of mercurial preparations hypodermically, is directed toward the use of subcutaneous injections of the cyanide of mercury in general.

I have used it on rabbits and on my patients to combat iritis with condylomata, keratitis, and choroiditis, all having a syphilitic origin. The dose used was from 5 to 10 milligrammes, and marked improvement followed after 10 or 15 subcutaneous injections. From time to time, however, I noticed that the disease would return, and had not been cured, and more especially the choroiditis. More than this, toxic symptoms became alarming, so that I was obliged to abandon the treatment; and I am, because of my experience, forced to write that it is not reliable in grave ocular conditions, and dangerous on account of its toxic effects.

If the preparations of mercuric cyanide are dangerous when used intra-cutaneously, they may be, however, very useful in the form of collyria lotions, warm fomentations, and instillations.

I used with much satisfaction the following solution in hot fomentations several times daily in the treatment of progressive atrophic choroiditis of the myope, and in atrophic choroiditis (disseminated) found in gouty subjects in the following dose:

Cocain hydrochl.	O. gram. 25
Mercuric cyanide	O. gram. 30
Aqua lauro. cerasi.	275 gram.
Aqua destil.	25 gram.

This same solution can be used in subconjunctival injections for severe cases of plastic and exudative choroiditis. H. A. B.

Retinal Hemorrhage in a Case of Leukæmia.

DUCLOS, I. (*Annales d'Oculistique*, Jan., 1897, p. 50.) Man aged 18, consulted him for a rather sudden loss of sight in the right eye, which took place two days before. Family history, father died of tuberculosis, mother neurasthenic.

He had measles and scarlatina at before 12, with numerous hemorrhagic manifestations, including hematuria. Despite the lesion in the kidneys which caused the latter, the case was not one of unusual severity. He commenced work in the fields at the age of 14 and continued at it with difficulty. He remained anemic, although he took all sorts of tonic and iron preparations. His food consisted almost entirely of bread and vegetables; seldom meat. The submaxillary, cervical, auxillary and inguinal glands, and the spleen were enlarged. Heart normal, no albumen, mere trace of sugar and slight increase in amount of uric acid; vision in the right eye was rather suddenly lost on September 19, two days before. When seen reflexes were present and no errors of refraction.

R. V, $= \frac{1}{50}$ L, V. $= 1$. Ophthalmoscopic examination: Large hemorrhage into the retina one-third of the way between papilla and macula, retina somewhat anemic and central vessels pale. The hemorrhage was sufficient to account for the amblyopia, although there was no apparent lesion at the macula. What caused the hemorrhage? Renal trouble as a sequel of the former scarlatina cannot be assigned as the cause on account of the probably normal condition of the urine. We think it a case of retinal hemorrhage due to leukæmia, rather than to simple enlargement of the glands.

An Anatomo-Pathological Study in a Case of Congenital Specific Choroiditis With Hemorrhage in the Retinal Layers, Caused by Thrombosis of the Central Vein.

DOR, LOUIS. (*Arch. d'Ophtal.*, Aug., 1895.) The retinæ were studded with punctiform hemorrhages, especially at the periphery; about the macula he found larger black spots. These hemorrhages had been caused by a thrombosis of the central vein at some earlier date.

As for the spots in the choroid, they were not of a hemorrhagic origin, on the same plane the choroid was adherent to the sclera, and retino-choroidal adherence could even in some places be seen. The nature of these spots seemed to be explained by an enormous infiltration of embryonal cells and red globules, and changes in the cells of the choroid proper. Finally, there was in both eyes a white spot which covered a large surface, but unique in its appearance. It was destitute of retinal pigment, showed marked changes in the choroid cells and an interstitial exudation.

The author calls to our notice the importance, for us all, to publish the results of our researches upon these variable cases of specific ocular troubles, because of their varied forms and irregular courses.

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Carcinoma of the Posterior Layer of the Iris.

(*Arch. d'Ophtal.*, Dec., 1896.) The posterior layer of the iris is part of the retina, and in consequence developed from the ectoderm. True carcinoma may, therefore, develop in it.

A man, aged 26, presented a grayish tumor behind the iris which is turned forward, the lens is dislocated. The tumor projects into the irregular pupil. An iridectomy for glaucomatous symptoms failing to relieve them, the eye was enucleated.

The tumor situated on the posterior surface of the iris was 10 mm. long and 5 mm. wide. It extended behind the superior border of the lens to the ora serrata; in front it pushed the iris against the cornea and filled the space between the iris and the anterior surface of the capsule of the lens, to which it was adherent about the middle of its upper half. It projected into the anterior chamber.

Histological examination: The tumor consisted of large cells having neuclei with vacuoles and considerable protoplasm; no intercellular substance. The vessels are derived from those of the iris. At a certain point the layers of the iris are separated; the cells of these lose their pigment and are continuous with those of the tumor. The upper half of the iris presents evidences of chronic inflammation. The lower half presents on its anterior surface little nodules of epithelial cells like those described in the tumor. On its posterior surface are small nests of cells adherent to the pigmentary layer. The vitreous in the neighborhood of the tumor has degenerated into fibrous tissue. In the lower part of the irido-corneal angle a small point of the neoplasm was discovered which accounted for the glaucomatous symptoms.

Treatment of Hemorrhage After Extraction by the Sclero-Corneal Suture.

TROUSSEAU, A., (*Archiv. d'Ophth.*, Feb., 1897, p. 106,) reports two cases in which complications following extractions have been successfully overcome by the sclero-corneal suture—one a prolapse of the iris and the other a hernia of the vitreous. It occurred to him that the same procedure would operate favorably in cases of hemorrhage after extraction.

CASE 1. Hemorrhage 24 hours after extraction treated by ergotin, hamamelis and compression by which it was somewhat controlled. Suture applied more to relieve a hernia of the vitreous than to control the hemorrhage. Enucleation avoided but the eye became atrophic and was painful at intervals.

CASE 2. Fifteen minutes after a normal uncomplicated extraction on an old lady, age 72, patient had a violent hemorrhage. Compression applied and sclero-corneal suture inserted, which immediately controlled the hemorrhage. Pain persisted for 4 or 5 hours, but in 24 hours wound lips were in apposition and wound closed with very little reaction. In 15 days patient resumed her duties. At time of writing the eye, though not seeing, has preserved its form and volume, is not painful nor infected and the patient requests a supplementary operation to improve the sight, which of course was denied.

The suture is indicated in all post-operative hemorrhages and has the following features to recommend it:

1. Prevents large loss of blood to the patient.
2. Prevents complications which result from delayed union of the wound.
3. Avoids necessity of enucleation.

Lee in the *Practitioner* reports a case of hemorrhage 24 hours after extraction in which the patient died some months later of angina pectoris, and thinks this case is one in support of the theory that the primary cause of hemorrhage in such case is a degeneration of the walls of the choroidal vessels, and that the only way to prevent this accident is to refuse to operate on patients who present unmistakable evidences of degeneration of the vessel walls.

Use of Electrolysis in Strictures of the Lachrymal Passage.

LAGRANGE, M. J., Bordeaux. (*Archiv. d'Ophth.*, Dec., 1896.) All the strictures found in the lachrymal passage other than congenital atresia of the ducts or those which are classed under osteological abnormality and traumatism of the bony portion of the apparatus are either inflammatory or cicatrical, or both. Electrolysis affects the last two in different ways, it can cure the first and is for the last generally the best palliative treatment.

The facts which we have gathered give us the following informations:

1. That negative electrolysis 3-5 milliamperes brings about very grateful results.

2. That it is capable of giving permanent benefit, in one or more séances, when used in the treatment of mild cases.

3. That in severe cases it facilitates greatly the use of Bowman's probes and also adds notably to the efficacy of catheterization by the same.

4. That when in the hands of prudent operators it can do no harm whatever, and that retractile cicatrices, ordinarily much to be feared, occur only when the strength of the current exceeds 6-8 milliampere.

Visual Disturbances in Tumors of the Chiasma.

JAEQUES, A., (*Des troubles visuelles dans leurs raports avec les tumeurs interessant le chiasma.* Paris, 1896,) reviews the visual disturbances in and their relationship with tumors of the optic chiasma. Observations in this class of cases on the living subject are very rare. By means of the study of the pathological physiology and of a limited number of observations he endeavors to show that in addition to the symptoms common to intra-cranial tumors there are others which, in many cases, enable us to reach an almost exact diagnosis, but he does not claim to have been able to decide the precise situation of the tumor, *i. e.*, whether its seat of origin was within or without the chiasma. His conclusions are as follows:

I. Intra-chiasmal tumors, either primary or secondary, are very rare. Lesion of the chiasma in the nature of a neoplasm is most frequently produced by (a) tumors of the sphenoidal sinus; (b) hypertrophy of the pituitary body, whether of neoplastic or acromegalic origin; (c) aneurysm; and (d) tumors of the adjacent parts especially.

II. From a symptomatic point of view the principal evidences of its presence are: (a) Lateral heteronymous hemianopsia, especially and almost always temporal; (b) amblyopia and amaurosis, generally very marked and out of all proportion to the changes in the fundus of the eye, discovered by ophthalmoscopic examination, which, at least at the commencement of the disease, are very insignificant. The secondary symptoms under this head are very much less important and as follows: (a) Those referable to compression of surrounding structures; (b) those common to cerebral tumors, limited to the base of the brain.

III. At the commencement of the disease, if there be lateral heteronymous hemianopsia, it is only a question as to the nature of the lesion. Hysteria, the author thinks, can be excluded. Later it is necessary to exclude those lesions which, outside those situated in the chiasma, can produce: (a) Hemianopsia on one side with amblyopia on the other; (b) double amblyopia.

Nature and Treatment of Exopthalmic Goitre.

ABADIE, CHAS. *(La Clinique Ophthal.)* The author published an article upon exophthalmic goitre in which he developed a group of arguments and facts which led him to set forth the belief that this strange affection was due to an irritation of the vaso-motor fibers contained in the cervical sympathetic.

This new doctrine concerning the pathogeny of Basedow's disease was discussed by several surgeons during the last Surgical Congress, some supporting strongly the views of the author, while others found some objections, and it is for the latter group that the following explanation is particularly written. Jonnesco (of Bucharest) reported two cases where section of the sympathetic has completely cured exophthalmia, While Kocher (of Berne) asked to take exception to some of the statements set forth in the new theory. He stated that he had had several good results from surgical treatment upon the thyroid body, and also that from thyroid extract medication he had observed signs of Basedow's disease. It is very easy to dismiss these objections and to prove that they in no way affect the advanced theory.

Kocher agrees that of all surgical interference made upon the thyroid body, the most efficacious is the ligation of the thyroid arteries, and not removal in part or total of the body itself. There is indeed no doubt that such is the truth, and that it also proves precisely the views of the author.

Since it is because of the permanent dilatation of these arteries that the thyroid body becomes hypertrophied, this hypertrophy is not primary, but secondary.

Will some one say that in operating upon the gland *per se* that great improvement has followed? If so what is its nature? The improvement of certain symptoms has been obtained, but only those having their exclusive origin in the over-stimulated gland. We must not lose sight of the fact that in Basedow's disease after the fundamental tripod symptoms have appeared through the irritation of the vaso-dilators, as maintained by the writer, that new ones occur, but of a secondary nature, brought on by the over-active thyroid gland, as stated by S. Kocher.

These are not localized in the head or in the neck, but extend all through the organism.

Such are muscular tremor, general sensation of heat, excessive prespiration and profuse diarrhea. Thus it becomes plain that these morbid manifestations of toxic origin can be abated, momentarily at least, by surgical interference on the gland *per se*.

But this improvement is ordinarily temporary and for better proof I will quote freely Mr. Jaboulay: "A very common result of surgical operations on the thyroid body is a shrinking of the remaining mass after partial extirpation of the goitre. But these phenomena do not take place in exophthalmic goitre. It is indeed just the opposite which took place in one of my patients suffering from Basedow's disease."

Laboring under the idea that the tripod symptoms were caused by the perverted thyroid secretion, I had several times operated on the thyroid body. I had luxated it, then exposed it to the air twice in succession. After the return of the symptoms, which had disappeared, it is true, following each operation I decided to remove the right lobe; later I was tempted to remove the left one because of its rapid growth, and I have since removed what had been left of the gland, *viz.:* the median lobe, which had in turn become the seat of a hyperplasia the size of a small orange. After each operation the symptoms disappeared just as before when the surgical treatment was only outside of the gland tissue proper.

The improvement was real and particularly prompt in the case of the muscular tremor. But they would soon return with the sad prospect of an accompanying goitre. From this it may be easily concluded that in exophthalmic goitre, when the exophthalmos predominates, surgical interference is not to be directed to the gland, but rather to the vessels which go to it, and in preference to the nerve filaments which supply the vessels.

Let us call attention, besides to the fact that in these grave forms where the thyroid body assumes such proportion as to endanger the life of the patient, exopthalmos is rarely observed.

Then if the theory of the hyperthyroidisation is true the exopthamos and the tachycardia should always be proportional in intensity to the hypertrophy. since they would be entirely subordinate to it, and occur as a result of it.

On the contrary we have already seen that in the severe cases of exophthalmos the enlargement of the thyroid gland was insignificant.

Finally as a complement to the above demonstration the author emphasizes the utter failure of surgical means, when directed to the thyroid body, to modify the exopthalmos in any degree.

Confronted by these facts and clearly demonstrated proofs we are obliged to abandon our idea of the dependance of exophthalmos on the hypertrophy of the gland,and to recognize willingly. or not, a very different origin.

We have now come to Kocher's last objection, mainly the development of Basedow's disease, from the use of thyroid extract. Such is never the case, but the so-called secondary symptoms of exophthalmic goiter may appear, and by those are meant the symptoms which arise from over activity of the gland. It will not be long before many clinical experiences will, without a doubt, demonstrate to the profession the unquestionable effect upon the exophthalmos of goitre of dividing the cervical sympathetic above the middle ganglion.

Jonnesco stated during the last congress that it was possible to remove the entire cervical sympathetic. I am convinced, so thoroughly convinced, says Abadie. that I prophesiy the arrest of development of the goitre by cutting the cervical sympathetic no longer above the middle ganglion, but below, for the vasodilator fibers which go to the superior and inferior thyroid arteries emanate from the superior and middle ganglions.

Therefore if we cut below the middle ganglion we shall cut off the path of the vaso-dilatation. which as we have seen, provokes and keeps up the hypertrophy of the thyroid gland. H. A. B.

ABSTRACTS FROM CURRENT NEURO-OPHTHALMIC LITERATURE,

By Wendell Reber, M.D.

PHILADELPHIA, PA.

An Experimental Investigation Into the Descending Degenerations Following Lesions of the Cortex of the Occipital Lobe.

Cecil F. Shaw and W. H. Thompson have investigated the conditions found after ablation of the occipital lobe, and after interruption of its fibers (sub-cortical lesion). Ten experiments in all were performed. The animals employed were six marmosets, two rhoesus, one callithrix, and one putty-nose monkey. In seven cases portions of the cortex were removed or isolated, two of these being sub-cortical lesions. In three experiments the occipital lobe was removed. We did not concern ourselves with the functional defects which followed these injuries further than to note that the animals showed a greater or less amount of hemianopsia for some time after the operation, especially apparent when taking food. Our attention was exclusively given to the resulting degenerations which we found to be as follows:

1. The degenerated fibers pass down by way of the corona radiata.

2. Having reached the level of the corpus callosum a division into two main groups occurs; one group traverses this commissure to reach the opposite side; the other group continues on into the internal capsule of the same side.

3. Of those which remain on the same side as the lesion, the majority occupy the hindermost part of the internal capsule, and end in the gray matter of the pulvinar, external geniculate body, and anterior corpus quadrigeminum. Others are found scattered throughout the posterior two-thirds of the internal capsule and descend into the crusta of the crus cerebri.

4. Of the crossed fibers, most pass into the white matter of the opposite occipital lobe and no doubt end in the cells of its cortical gray matter. Others, however, turn

forward and descend in the internal capsule, occupying its posterior two-thirds. These ultimately reach the crusta of the two crura cerebri.

5. Some of the degenerated fibers occupying both crusta probably end in the gray matter of the substantia nigra, while others reach the pons.

6. Degenerated fibers also pass toward the posterior commissure; some of these traverse it to gain the opposite side and turn downward; others remain uncrossed. Both sets apparently end in the gray matter around the aqueduct of Sylvius. These supply a connection between the cortex of one side and the nuclei of nerves to the eye muscles on both sides.

7. A few degenerated fibers were found in the posterior longitudinal bundles on both sides, probably some of the set last described. Others, inconstant in number and situation, were found in most of the tracts of the medulla and cord. No importance attaches to these latter.—*British Medical Journal, September 12, 1896.*

Ocular Symptoms Associated With Tumors of the Pons.

Hoffman, (*Virchow's Archiv.*, Bd. CXLII) records the following symptoms in the visual sphere accompanying pontile tumor:

Paralysis of the right trochlearis, abducens, facial, oculomotor, and the sensory branch of the fifth nerve; also, on the left side, the internal rectus branch of the third nerve, transient paralysis of the aducens, and hyperesthesia over the sensory area of the left trigeminus. After death the tumor was found to occupy the major portion of the right side of the pons. Bischoff, *Jahrbucher f. Psychiatrie und Neurologie*, Bd. XV,) details four instances of tumors of the pons in each of which there was quite an array of eye symptoms, as follows:

Case 1. Preceded by sciatica and dizziness. Two years later, paralysis of the left facial and orbicularis and the left abducens. On the right side there was paresis of the right internus in left lateral conjugation and paresis of the right abducens. Bilateral nystagmus was also present. The autopsy showed a gliosarcoma of the left pons and medulla involving the left middle peduncle of the cerebellum. The microscope discovered degeneration of the roots of the fifth to the twelfth nerves and the nuclei of the fifth, seventh and eighth nerves.

Case 2. The trouble began with right abducens paralysis, followed by paresis of the right facial, and deafness. Some months later there appeared paresis of both interni and the former paresis of the right facial developed into a paralysis, with anomalies of motion and sensation in the trunk and lower extremities. At the autopsy there was found a sarcoma of both halves of the medulla, the right half of the pons, and the right corpus quadrigeminus in consequence of which there were involved both pyramidal tracts, both lemnisci, the root fibers of both abducens, the right acoustic, facial, and trigeminus, and both posterior longitudinal bundles proximal from the sixth nerve nucleus. The left fifth and sixth nerve nuclei were normal.

In view of the fact that there was present in both cases during life disturbances of conjugation, although the autopsy showed no lesions of the oculo-motor nuclei, Bischoff assumes that in both cases the disturbed conjugation must be explained by the destruction or disease of the sixth nerve nuclei and the posterior longitudinal bundles proximally therefrom; in which case it seems reasonable to further assume that when there are disturbances in the conjugate movements of the eye, without associated impairment of the third nerve functions, it will be justifiable to expect to find, post mortem, degeneration of the sixth nerve nuclei and the posterior longitudinal bundles proximally therefrom.

Meddlesome Surgery in Exophthalmic Goitre.

At the February meeting of the Hamburger Aertzlicher Verein (*Neurologisches Centralblatt*, April 15, 1897,) Saenger exhibited a woman, a seamstress aged 28, who was the subject of classic Basedow's disease. Influenza preceded the goiter by several months. In the early trouble with the goitre she consulted an oculist on account of the exophthalmus. He discovered hyperplasia of the right thyroid, and referred her to a surgeon who extirpated the right half of the gland, following which there was lessened tachycardia. Albeit, all the other symptoms soon became so much aggravated that the patient became utterly unfit for work. The exophthalmus increased, Graefe' and Moebius' sign developed, and profound neurasthenia supervened as evidenced by contracted visual fields, retinal tire, blepharospasms, terrific headache, etc. Finally, the middle and left lobe of the thyroid gland hypertrophied. Saenger uses the incident as a warning against surgical interference in Graves' disease, except in the most threatening cases. He challenges surgeons to show lasting benefit following extirpation of the gland.

On the Diagnosis of Paralysis of the Sympathetic.

The author draws attention to the fact that in instances of pathologic paralysis of the sympathetic, there is not always observed the train of symptoms that are produced in physiologic experiments on the sympathetic nerve. The most constant signs are those of the pupil and eyelids. He quotes a case of his own, occurring in a 31-year-old man, supposed to be the subject of mediastinal tumor. The widely dilated left pupil, the enlarged palpebral fissure and prominent globe led to the diagnosis of *irritation of the left sympathetic*. Later, paraplegia developed suddenly. As the left pupil reacted promptly to light during all this time, it was then thought likely that the condition was not a *left irritation*, but a *right sympathetic paralysis*, which idea was substantiated at the necropsy when it was found that the right sympathetic nerve was destroyed from the upper border of the seventh cervical to the upper border of the fourth dorsal vertebra by a process from one of the posterior lobules of the thymus gland.—*Neurolog. Centralbl., April, 1897.*

Ocular Symptoms in Polyencephalitis Superior Hemorrhagica

Objective signs in the visual sphere are so nearly constant in polyencephalitis superior hemorrhagica, that the symptom complex becomes of considerable interest to the ophthalmic worker. We have on other occasions alluded to this picture, to which different accounts we will add the following ocular signs noted in a 41-year-old woman, afflicted with the above mentioned disorder: Paralysis of the left third nerve, left internal ophthalmoplegia and paresis of the motor filaments of the left trigeminus. The right eye was unaffected. The autopsy revealed aneurism of the ascending aorta, gumma of the cardiac muscle, and innumerable hemorrhages into the gray matter of the third ventricle and aqueduct of Sylvius. The nuclei of the bulbar nerves were unaffected, as were also the vessels of the basis cranii.—*Hori and Schlesinger in the Neurologisches Centralblatt, March 15, 1897.*

Contribution to the Pathology of Chronic Bulbar Diseases.

From a study of this class of cases conducted by Drs. Cassirer and Schiff in Prof. Obersteiner's labaratory we abstract the following:

Case 1. A 42-year-old alcoholic. Almost complete internal and external ophthalmoplegia with impairment of the functions of the facial, trigeminius, auditory, and hypoglossal nerves.

Case 2. Butcher, age 44. Tabes dorsalis. Bilateral complete internal and external ophthalmoplegia. Sensory disturbances in the trigeminus, and motor impairment of the facial and hypoglossal; also athetoid movements. There was found post mortem, degeneration of the lateral and central oculo-motor nuclei as well as the oculo-motor roots, while the Edinger-Westphal and the Darkschewitsch and anterio-medial nuclei were intact.

Case 3. Forty-one-year-old female. Tabes and optic atrophy, hemiatrophy of the tongue, disturbances in the third nerve area, also in the area of the fifth, seventh and eighth nerves. The necropsy showed degeneration of all the nuclei mentioned, save the hypoglossal and auditory.

Case 4. Sixty-six-year-old woman—tabic—meningitis basilaris acuta. There was complete left internal and external ophthalmoplegia, right iridoplegia, and slight impairment of function of the facial and hypoglossal. Post mortem examination revealed degeneration of the left oculo-motor nucleus and the intramedullary root bundles of the left oculo-motor nerve. The Edinger-Westphal, Darkschewitsch, and anterio-medial nuclei were immune.

From their studies, Cassirer and Schiff deduce the conclusions that accurate localization of the different nucleoli in the oculo-motor nucleus is not yet possible; they offer the following probabilities: That oculo-motor fibers arise only from the lateral and medial nuclei; that the so-called anterior nucleus of Darkschewitsch and the small-celled antero-medial nucleus are not to be viewed as centers for the intra-ocular muscles; that the entire anterior nuclear group and the Edinger-Westphal nucleus are not to be regarded as oculo-motor nuclei; that the fibers to the levator palpebræ superior appear to run in the lateral root bundles; finally, that no center for the oculo-facial is to be found in the oculo-motor nucleus.—*Neurologisches Centralblatt, March 15, 1897.*

A Discussion on the Pathogenesis of Choked Disc.

At the March meeting of the Berlin Neurologic and Psychiatric Society, Dr. Jacobson presented the following case and comment:—*(Neurologisches Centralblatt, April 1, 1897):*

The patient, a girl 5 years old, is the daughter of perfectly healthy parents. In her third year, during the critical phase of one of the diseases of childhood, she developed a paresis of the left half of the body, associated with left hemianesthesia. Coincident with this there occured slight enlargement of the cranium. No convulsions or unconsciousness. The subjective symptoms were unimportant. save spells of momentary exaggerated fatigue. About this time choked disc in its earliest stages was detected, but it soon disappeared, returning no more during the child's life. Two years after the occurrence of the first paresis. death ensued from an acute febrile disorder.

Two tumors were discovered at the necropsy; one the size of a large hazelnut, was situated on the left circumference of the cerebellum involving its medulla, the other the size of a walnut, occupied the whole lenticular nucleus, the posterior knee of the internal capsule and the anterior portion of the thalmus. Both growths were solitary tubercles. Though they increased the volume of the intracranial contents, there was no hydrocephalus. The bones of the cranial vault were thinned and distended, in consequence of which the cranial cavity was widened.

The main point of interest in the case was the development of mild grade choked disc and its subseqnent precipitate spontaneous disappearance.

On Choked Disc.

This the author attributes to sudden augmentation of the intra-cranial pressure, which subsided just as suddenly not long afterward.

The case, in its analogy to those instances of cerebral tumor in which craniectomy induces complete dissipation of the papillary edema, lends probability to the mechanical or obstruction theory of choked disc. Jacobson quotes Bruns' case in which the papillary symptoms faded away after relief of the increased intra-cranial pressure by trephining, during which process no cerebral fluid escaped.

Jacobson thinks Bruns may have overlooked the fact that opening of the cranium is not absolutely necessary for the elimination of the toxines; that, on the contrary, they may be easily carried off by the ordinary lymph channels when the pressure within the cranium is lowered by whatsoever cause, permitting the resumption of function on the part of the lymph channels.

In the discussion which followed the report of the case, Dr. Oppenheim said:

"The case is altogether unique in that in spite of the continued growth of the two tumors there should occur such sudden dissipation of the choked disc observed early in the history." Oppenheim thought the latter fact was strong evidence for the mechanical theory.

Schuster spoke of "a case observed in Mendel's clinic of glioma pressing on the right lateral sinus. During the progress of the disease the disc became choked and returned to the normal several times."

Goldscheider opined "that brain tumors accompanied by the severest disturbances often induced no papillary stasis whatever. He mentioned one of his own cases in which the choking of the disc disappeared after lumbar puncture, reappearing later and finally melting away spontaneously. He thought that the mechanical and inflammatory factors had probably both played a part."

Greeff made the point that "choked disc may exist for a long time without embarrassing vision in the least."

In the May 1st number of the *Neurologisches Centralblatt*, Dr. Bruns replied to Dr. Jacobson's article, saying: "We will interest ourselves only with the main clinical feature of our case, to which Dr. Jacobson alludes in his article, namely, that choked disc was observed in the beginning of the disease, after which it was seen no more." This Jacobson ascribes to the fact that the cranium yielded and expanded with the increase in volume of its contents; but when the cranial expansion failed to keep pace with increase in volume of the brain and tumors, papillary stasis was induced. Now, we can only say that in this statement J. allies himself unmistakably with the believers in the mechanical origin of choked disc.

In an article published in the *Arch. f. Psychiatrie und Nervenheilkunde*, Bd. XXIX, by Jacobson and Jamane on the pathology of tumors of the posterior cerebral fossa, Jacobson stated that his clinical, as well as microscopic, findings threw the weight of their evidence in favor of the mechanical hypothesis; nevertheless, he was not ready then (as it seems he is not yet entirely willing,) to renounce Deutschmann's irritation or toxic inflammatory theory. Two years ago I (Bruns) committed myself to the mechanical hypothesis—Brain Tumors: Eulenberg's Real Encyclopedia, third edition, Vol. VIII., p. 652, et sequitur

—on the ground that the edematous papillitis found associated with brain tumor invariably subsided after trephining. However, as it might be urged by the advocates of toxic papillitis that the nerve trouble subsided because of the withdrawal of the toxines along with the escaped cerebral fluid, I submitted an instance in which the new growth so presented itself in the cranial opening as to prevent the escape of any cerebral fluid whatever, notwithstanding which the optic neuritis promptly vanished. The tumor had been forced partly out through the opening by the intra-cranial pressure. The conclusion seems obvious that the choked disc of brain tumor is the expression of a simple mechanical process—in short, is not neuritic, but purely edematous in nature.

But Jacobson views the facts in another light, and believes that I have failed to reckon with the fact that when the intra-cranial tension had been reduced the toxic lymph found exit by the now reopened normal channels, seeing which the neuritis faded away for want of further irritation.

This fact did not escape me, and my statements left no doubt that I regarded the choked disc as directly related to confinement of the cerebral lymph, and that only by diminishing the latter could the neuritis be influenced. Furthermore, it has not been shown that the quantity of toxines is as much reduced by withdrawal of the cerebral lymph through the regular channels, as when large quantities are excavated through a trephined opening. It must not be forgotten that in the former case the lymph is still rich in toxines, and the poisonous fluid has almost as much access to the nerve head as before the pressure was reduced. In my own case no sudden escape or withdrawal of these hypothetical toxines could occur; wherefore, then, the sudden disappearance of the choked disc? Well established neuritis is a process not to be immediately controlled by withdrawal of the exciting agent. Diabetic neuritis, for instance, is slow of recovery, even when the sugar has been eliminated from the blood by an anti-diabetic diet. An edema, on the other hand, disappears along with the cause that gave rise to it, seeing which things I must accept the phenomena in my own case as incontrovertible evidence for the mechanical theory. Finally, even though one embrace Jacobson's postulate of a mechanico-inflammatory theory, it must occur to them (and Jacobson and Goldscheider have said so in so many words.) that the stagnation is the primary factor. The toxines would never find their way down the optic nerve sheaths to the nerve head, there to set up papilitis, were it not for the increased intra-cranial pressure, therefore I contend that even though there be innumerable toxines in the cerebral fluid, they can avail nothing save in the presence of increased intra-cranial pressure.

Jacobson, in replying to Bruns (*Neurologisches Centralblatt*, May 1, 1897,) remarks: "Such evidence as has been adduced in recent years cannot be lightly set aside by the advocates of the inflammatory theory, notwithstanding which they are not yet ready to admit that the increased pressure within the cranium is the sole agent. There is yet room for argument, although Bruns seems to think all argument is useless in the face of his own particular case. I can only repeat what I have here before stated, that lowering of the intracranial pressure, no matter how accomplished is sufficient to permit the resumption of the normal lymph circulation in consequence of which the toxic lymph will be withdrawn from the optic nerve sheaths, and even though there might remain small quantities of the toxines, the number would be too small to give rise to added irritation, or to continue any that might be already present. As a secondary argument for the mechanical theory, Bruns (and Oppenheim, too) lays stress on the precipitate disappearance of the papillitis. If we are dealing with a simple pressure phenomenon in choked disc, why have we not been able to produce it experimentally? Even in animals, whose smaller cranii would favor the object of the experiment, it has been impossible to produce papillary edema when aseptic precautions are observed. Therefore, until more convincing results can be shown, we cannot give in our adherence to the one or the other theory. I contend that in brain tumor there is given off irritant material, which in turn increases the intra-cranial pressure, which later then in its turn forces the irritant lymph down the optic nerve to induce toxic choked disc. Hence, without the irritant toxines, there can be no choked disc, and without confinement of the lymph also, there can be no choked disc. The primary agent is the irritative material and the resultant secondary, (yet powerful) factor is the stagnation.

NOTES AND ANNOUNCEMENTS.

(Under this heading the ANNALS will publish items of iterest to its readers. Please address Albert B. Hale, M. D., Columbus Memorial Building, 103 State street, Chicago.)

Privat Docent Dr. Axenfeld has moved from Marburg to Breslau.

Prof. v. Esmarch in Kiel has received the title of "Excellenz"—excellency.

Dr. Andreas Anagnostaki, professor of ophthalmology at the University of Athens, Greece, has died at the age of 71.

Dr. John Welsh Croskey has been elected attending surgeon to Wills' Eye Hospital of Philadelphia, as successor to the late Dr. Peter D. Keyser.

Dr. Harold Gifford, of Omaha, Neb., was elected chairman of the section of ophthalmology at the recent meeting of the American Medical Association at Philadelphia.

Dr. Casey A. Wood is in Europe, and will attend the meeting of the twelvth International Medical Congress at Moscow. He will return to Chicago about the middle of September.

Washington, D. C. has a new hospital called the Episcopal Eye, Ear and Throat Hospital, dedicated on April 7. It is open every day for the tratment of dispensary cases.

Señorita Trinidad Arrayo Villaverde won her doctorate degree in medicine and surgery (Spain.) by a thesis on the normal and pathologic conditions of the intrinsic eye muscles, and the action of drugs upon them.

At the request of the Russian czar all foreigners properly qualified to attend the coming International Medical Congress at Moscow, are to be given free railway transportation from the Russian frontier to Moscow and return by any route selected. This will materially lighten the expense of the trip and add to its pleasure.

There will be published in the January number of the ANNALS OF OPHTHALMOLOGY a Study of the Ophthalmoscopic Changes in Chlorosis, Pernicious Anemia and Leucocythemia, by Charles A. Oliver, being a study of a series of cases varying from chlorosis to leucocythemia, in which not only the ocular changes are exhibited, but a study of the blood and general condition. This will be illustrated by six chromo-lithographs reproduced from drawings by Miss Washington.

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Burchardt, in an address before the Charité Physicians on October 29, 1896, expressed the opinion that trachoma is the same as, or allied to, the skin disease called malluscum contagiosum. An exhaustive history of molluscum was given, to show that it is really contagious: and trachoma was illustrated by methods of the author to show that the corpuscles in it are not leucocytes, but molluscum bodies.

◆

The Western Ophthalmological, Otological, Laryngological and Rhinological Association held its second annual meeting in St. Louis recently, and elected officers for the ensuing year as follows: President, Dr. B. E. Fryer, Kansas City: vice-presidents, Dr. J. Elliott Colburn, Chicago, Dr. F. M. Rumbold, St. Louis, and Dr. E. A. Bulson, Jr., Fort Wayne; secretary, Dr. Hal. Foster, Kansas City; treasurer, Dr. W. L. Dayton, Lincoln. The next meeting will be held in Chicago, April 7 and 8, 1898.

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The London *Lancet* of May 1, 1897, has a long and instructive article on the question of hospital abuse, as applied particularly to the Royal London Ophthalmic Hospital at Moorfields. One great difficulty to be met in any attempt to correct charity abuse is the great and wide-spread reputation of Moorfields; a case is reported of a man who came from Peru, working his passage across so as to consult Moorfields. Another case is mentioned to show the sincerity of some patients, although it incidentally reflects on the skill of provincial surgeons. A woman had applied to a local eye doctor, who spent in all five hours in an examination, using a mydriatic, but acemplished no good. The patient's money being nearly gone she went to London, and in an hour and a half received glasses that gave her relief. Again, the system of high fees demanded (often necessarily) for operations, precluded their payment by those who are willing to pay moderate fees and who, therefore, go to a hospital. In fact, the report merely illustrates the condition of hospital charity while not admitting, in esse, the charge of abuse; but no correction for the evil can be found, nor is any suggestion offered.

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To the Editor of the ANNALS OF OPHTHALMOLGY:

SIR—In Dr. W. Franklin Coleman's excellent paper, entitled "Preliminary Iridectomy in the Extraction of Senile Cataract," printed in the April number of the ANNALS OF OPHTHALMOLOGY, the following sentence occurs: "*Advantages of Preliminary Iridectomy.*—There is reasonable excuse for the consideration of an operation which not a few regard as the safest for the extraction of cataract, but about which some authors (Mittendorf, Noyes, Mayer, de Schweinitz, Schweigger, Fuchs and Fick,) are silent." Evidently Dr. Coleman has overlooked the following paragraph in my text-book on "Diseases of the Eye," page 616 in the first edition, and page 634 in the second edition: "*Preliminary Iridectomy.*—Some operators, almost as a rule, perform preliminary iridectomy and extract several weeks later, believing that this lessens the dangers of extraction. It is to be recommeded in any case where serious complications are apprehended, and where for any reason an extraction in one eye has terminated unfavorably." The last sentence of this paragraph represents my views on the advantages of preliminary iridectomy. Respectfully yours,

G. E. de Schweinitz,
1401 Locust Street, Philadelphia.

◆

There will be held in Brussels in September an internatioual conference to discuss the hygiene of railway and steamship navigation. The subjects proposed are:

1. The Organization of the Medical Service.
2. Assurances for Personal Sofety.
3. Medical and Hygienic Rules.
4. Protection Against Transmissible Diseases.

Many prominent ophthalmologists will take part.

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The *Ophthalmic Record* has about concluded arrangements with the Wabash and Canadian Pacific railroads for a rate to Montreal and return for those desirous of attending the meeting of the British Medical Assocration, to be held in that city, August 31, September 1, 2, 3. Although only those who have received invitations from the council of the British Medical Association, can take part in the proceedings. The same rate will be given to physicians and their families who care to make the trip to Montreal. The rate will in all probability be one fare for the round trip, from Chicago. Any further information may be obtained by addressing the *Ophthalmic Record*, 103 East Adams st., Chicago, Ill.

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The formation of the sections below named for the Montreal meeting of the British Medical Association is as follows:

Ophthalmology.

President, Mr. Edward Nettleship, F. R. C. S., London.

Vice-presidents, Dr. F. Buller, Montreal; Dr. R. A. Reeve, Toronto; Dr. Ed. DesJardins, Montreal; Dr. A. A. Foucher, Montreal.

Hon. secretaries, Dr. W. H. Smith, Winnipeg; Dr. Jehin Prume, Montreal; Mr. Thomas Herbert Bickerton, 88 Rodney street, Liverpool.

Laryngology and Otology.

President, Dr. Greville MacDonald, London.

Vice-presidents, Dr. W. Tobin, Halifax; Dr. G. A. S. Ryerson, Toronto; Dr. H. S. Burkett, Montreal; Dr. G. R. McDonagh, Toronto.

Hon. secretaries, Dr. A. Cretien, Montreal; Dr. H. D. Hamilton, Montreal; Dr. W. Permewan, 7 Rodney street, Liverpool.

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Mississippi Valley Medical Association.—Meeting at Louisville, Oct. 5, 6, 7, 8, 1897.

The executive committee met recently at Louisville, in conjunction with the local committee of arrangements, the following being present: Drs. Stucky, Grant, Mathews, Love, Holloway and Reynolds. It was determined to make the coming meeting the largest and best in the history of the association, and everything points to a fulfillment of this endeavor. The railroads will make a round trip rate of one and a third fare, or probably one fare. The address on surgery will be delivered by Dr. J. B. Murphy, Chicago; the address on medicine, by Dr. John V. Shoemaker, Philadelphia. Titles of papers should be sent to Dr. H. W. Loeb, secretary, St. Louis, Mo.

BOOK NOTICES.

A System of Diseases of the Eye.

By American, British, Dutch, French, German and Spanish authors. Edited by Wm. F. Norris, A. M., M. D., and Charles A. Oliver. A. M., M. D., of Philadelphia, Pa., U. S. A. Published in 4 volumes by J. B. Lippincott, Philadelphia, Pa., 1897.

Volume II. is a book of 556 pages, with 13 full-page plates and 214 text illustrations. The paper is of best quality and type is clear cut. Each article is illustrated in a manner which leaves nothing to be desired, and the index of 15½ pages is exceptionally complete.

It treats of the methods of examination, taking each group in regular order, beginning with "The Methods of Determining the Acuity of Vision," by Snellen, Sr., translated by Berry, giving a review of the different methods and test types in existence, and discusses their various merits.

"Mydriatics and myotics" by Snellen, Jr., compares the action of the various drugs used, and gives the results obtained with each after thorough investigation.

The subject of "Lateral Illumination" is treated by Laqueur and is well written.

"The Ophthalmoscope and the Art of Ophthalmoscopy," by Gould, is an history of the evolution of the ophthalmoscope and has a minute description of the various instruments in vogue. The method of using the ophthalmoscope and how to overcome the difficulties found by beginners in its use is exceptionally clear. The emmetropic fundus and its most common anomalies are described.

"Skiascopy (the shadow test, retinoscopy) and its Practical Application," by Jackson, is one of the most interesting and ably written articles in the book. The optic principles of skiascopy are clearly outlined, aiding greatly in understanding its practical application. The appearance of the shadow in each form of emmetropia is described in detail.

Javal, Jr., in his article, "Ophthalmometry and its Clinical Application," describes the uses of the ophthalmometer and gives its history, together with a description of the instruments (Javal-Schiötz and Helmholtz) and mechanism. The method of using the instruments, together with statistics and ophthalmometry of different parts of the anterior surface of the cornea and its posterior surface, are all described in a comprehensive manner.

The treatise on "Prisms and Prismometry," by Dennett, beyond doubt contains more than the average ophthalmic surgeon has need for. It is, however, a thoroughly scientific discussion of prisms and their relation to ophthalmology.

"The Principles of, and Methods for the Estimation of the Balance of the extra-ocular muscles," by Stevens, describes prisms and their uses, divides the muscular anomalies into classes, defines the terms used, and describes the various tests and instruments used, in an elaborate manner.

For "Perimetry and its Clinical Value," by Wilbrandt, translated by Pooley, too high praise cannot be given to this very excellent article. He first describes the field of vision and the instruments used. In a "special part" of the article, in order to better understand the significance of the visual fields in the diagnosis of disturbances of the visual apparatus, the author makes the following divisions: I. Visual fields in diseases of the retina and choroid. II. Diseases affecting the optic nerve. III. Diseases of the optic chiasm. IV. Diseases of the optic tract. V. The primary optic centers. VI. The intra-cerebral tracts leading to the cortical centers. VII. The visual centers in the cortex of the brain.

Each division is accompanied by a table of symptomology and illustrations of visual fields found in these conditions.

Of Thompson's article on "Detection of Color Blindness," in which he is ably assisted by Weiland, too much cannot be said in praise. It is accompanied by a chromo-lithograph showing the solar spectrum with Fraunhöfer's lines as it appears to the normal eye, together with the solar spectrum of the green-blind and red-blind person. Dangers due to color blindness are pointed out in a manner which if set before the general laity would cause an uproar against railroad and steamship companies which do not insist upon examination for color blindness in their employes. The tests and methods used in the detection of this anomaly are the most interesting portion of the article, and are so practically and plainly stated that even a novice could carry them out.

Risley's scholarly essay on "School Hygeine" needs only to be seen with its accompanying statistics and illustrations to be appreciated. A more accurate résumé of the conditions underlying the hygiene of the eyes in school cannot be found. The subject is considered in parts, *i. e.*: I. Defects of vision in school. II. Necessity for an entrance examination. III. Hygiene of the school room giving illustrations and plans of the most modern achievements in lighting and hygienic surroundings. Part IV. treats of school furniture, blackboard, maps and books.

"Blindness, Its Frequency, Causes and Prevention," by Hays, relates to statistics and is carried further forward and made more general than any other paper or monograph upon the subject.

"Antisepsis." In this Andrews thoroughly covers the ground of how infection may reach the eye and the means of prophylaxis at our disposal, together with methods of preparing instruments for operation and after dressings.

Volume II. is concluded by McFarland and Kneass, who give a thoroughly up-to-date paper on "The Micro-organisms of the conjunctiva and Lachrymal Sac," including much experimental work, and giving the latest views.

To say the least, the book is a thorough encyclopedia of the portion of ophthalmology of which it treats. N. M. B.

Retinoscopy.

THORINGTON, JAMES. Retinoscopy (or shadow test) in the Determination of Refraction at One Meter Distance, with the Plane Mirror; 24 illustrations; P. Blakiston, Son & Co., Philadelphia, 1897.

As a portion of the title shows, and as the author states in the preface, this brochure of 66 pages is intended to elucidate in as concise a manner and few words as possible, the method of applying retinoscopy, and is supplementary to the excellent work on skiascopy by Edward Jackson. The editor does not consider that the method should be known by any other names than the *shadow test* or *skiascopy.* One of the obstacles to the use of this meteod for determining the refraction, is the confusion occasioned by the many long names with which it has been stigmatized. The rapidly growing number of progressive ophthalmologists who have familiarized themselves with the shadow test, will agree with the author in the following axiom: "That with an eye otherwise normal, except for its refractive error, and being under the influence of a reliable cycloplegic, there is no more accurate objective method of obtaining its exact correction than by retinoscopy."

Retinoscopy gives the following advantages:

The character of the refraction is quickly diagnosed.

The exact refraction is obtained without questioning the patient.

Little time is required to make the test.

No expensive apparatus is necessarily required.

Its great value can never be estimated in nystagmus, young children, amblyopia, aphakia, illiterates, and the feeble minded.

The aspirant should remember, however, that skiascopy is a difficult method to master, and that although the theoretic basis is perfectly simple and the phenomena readily observed, nothing but a thorough understanding of the optic principles and long practice, will render one an accurate skiascopist. Thorington's work deals with the test with the plane mirror at 1 m., which is the most available distance. There are, however, many cases in which a greater or less distance should be used. It is not to be considered that the patient's glasses are ordered immediately from the result obtained by retinoscopy, but the objective work should be confirmed at the trial case. The writer does not extoll too highly the shadow test, but reminds those who have tried retinoscopy and have failed, and then ridiculed it, that the fault with them is *back*, and not in front of the mirror.

The editor commends this little work most highly, but would advise students of the method to read Edward Jackson's monograph on skiascopy in connection, as the latter is more complete and goes more thoroughly into the optical principles involved. H. V. W.

Retinoscopy has come to stay. It is not a fad, neither a fashion. It is scientific, and withal so eminently practical in its application as to commend it to every thinking worker in ophthalmology. The tendency in the medicine of today is toward objective methods. . An objective method must possess two attributes: Exactness, and absolute independence of the patient's testimony. In addition to these qualities, an objective method must, if it is to meet with general acceptance, be easy of application. Ophthalmoscopy and ophthalmometry are but relatively exact in refraction work, seeing which the trial case has held its supremacy up to date; nor would we wish to relegate it to the back-ground. With a patient whose testimony is trustworthy exact results are thus obtainable, but it requires the most intelligent coöperation on the part of the examined. If, however, there be but the least departure from the conditions essential to close work with the test lenses, (as for instance with foreigners, illiterates, children, partial amblyopies, or mental astigmatics), retinoscopy stands ready to furnish a verdict from which there can be no appeal, when one has learned to properly interpret the movements observed in the pupillary area. It is to the elucidation of these latter movements as observed through a plane mirror at a distance of one meter that Dr. Thorington devotes himself in the volume before us. The treatment of the subject is so beautifully simple, that one who runs may read. W. R.

The Relation of Interstitial Keratitis to General Disease.

Greeff, Richard, Berlin. *(Die Keratitis interstitialis (parenchymatosa) in ihren Beziehungen zu Allgemeinerkrankungen.)* Verlag von Karl Marhold, 1897. Sammlung zwangloser Abhandlungen aus dem Gebiete der Augenheilkunde. I. Band, Heft 8.

There is no class of publications among all the German ophthalmic works that hold for us more interest than these "brochures on ophthalmic topics of especial interest to the general practitioner." Ophthalmic writers are prone to discuss the technical aspects of their own side of medicine, or if, perchance, they hit upon the subjects closely allied to general medicine, they most invariably (and perhaps unconsciously) drift into the technical phraseology of their own particular science, by which fact they cannot but at least partially cloud their meaning to those who would follow them. Dr. Vossius and his collaborators were not slow to note the forces that are making for isolation of the special from the general workers, and by their delightful series of discussions on borderland topics touching both the oculist and physician, these gentlemen are doing an admirable service to medical science. W. R.

This number has forty-seven pages giving the continental ideas as to the occurrence of interstitial keratitis, which is not an uncommon disease, occuring in 279 cases out of 36,385, (0.77 per cent.) The appearances, course and symptoms of the disease are clearly shown. The distinction between superficial and interstitial keratitis is given as follows: Superficial keratitis is generally a symptom of scrofula and is accompanied by nasal disease, eczema, swelling of the glands, etc. Interstitial keratitis in its typical binocular form, is in the most cases a symptom of heriditary syphilis. Keratitis punctata and keratitis centralis annularis are described as atypical forms. The following table shows the age at which cases of interstitial keratitis commonly occur:

AGE.	1–5	6–10	11–15	16–20	21–25	26–30	31–35	36–40
Number of cases - - - -	26	53	63	70	27	20	19	19
Percentage - - - - - - - - -	9.3	19.0	22.5	25.0	9.68	7.17	6.81	0.36

G. notes that it is possible for keratitis to be intrauterine and that many congenital opacities of the cornea must be due to this condition. The disease is subject to relapses from 17 per cent. to 31 per cent., some patients having as many as five. The prognosis is fairly good as the cloudiness of the cornea passes away, as a rule, without leaving thick opacity, but it is quite possible by focal illumination to find small opacities and remaining blood vessels. The etiology is of special interest. From 60 per cent. to 80 per cent. of cases being due to hereditary syphilis. It is certainly necessary to examine the entire body of all cases with acute interstitial keratitis, although none of the other symptoms of hereditary syphilis are as characteristic as interstitial keratitis. The Hutchinson's teeth, deafness without symptoms and interstitial keratitis, render diagnosis of hereditary syphilis safe. Other symptoms, especially the shape of the head and nose, joint disease, etc., are certainly to be taken into consideration. Interstitial keratitis is seldom to be ascribed to acquired syphilis. It may, however, come eight to ten years after the infection. Keratitis punctata profunda is more often due to syphilis. After hereditary lues, tuberculosis is the most common cause. After this, come diabetes, influenza and disease of the female genital organs. Reports have been made of interstitial keratitis in connection with chronic skin diseases and in general malnutrition, blood or blood vessel disease. Interstitial keratitis has been observed in the case of animals, which certainly do not have syphilis. Therapy of this disease is dealt with the following words: "There is no therapeutic help which can prevent or shorten the progress of the disease or prevent its occurrence in the second eye." The treatment is considered locally and generally. In the onset, hot compresses relieve the pain and sometimes the inflammation. He advises wet absorbent cotton placed upon the eye over which gutta percha paper and a bandage is bound, to be renewed once or twice a day, and the eye may be bathed in warm water. Bandage is of benefit at night; 2 to 4 per cent. boric acid is advised. The editor is pleased that the following sentence occurs: "The so beloved chamomile tea has no advantage over hot water. It is less clean and can flood the eye with uncleanliness." Atropin is advised when iritis occurs. As soon as the painful symptoms have let up, treatment by mercurials and iodide of potash salve is advised, combined with massage. Periotomy of the vessels about the cornea has been done with advantage. Paracentesis of the cornea and iridectomy are condemned. Sub-conjunctival injections of sublimate seem to have no advantage. Mercurials and diaphoretics are proposed for treatment in the order named. In tuberculous disease there is little to be said beyond creosote and guaiacol. It is sometimes necessary to remove the eye. In rheumatic cases and in diabetes treatment for the general affection is necessary. H. V. W.

The Importance of Ocular Antisepsis and Asepsis.

BACH, L., Wurzburg. (*Antisepsis und Asepsis in ihrer Bedeutung für das Auge.*) Sammlung zwangloser Abhandlungen aus dem Gebiete der Augenheilkunde. I. Band, Heft 7. Verlag von Karl Marhold, 1897.

A brochure of 16 pages. There are a large number of antiseptics used in ocular therapy. New indications, new medicines and new methods of treatment are constantly appearing. The well tried antiseptics are the following: Sublimat, 1:3000 and 1:5000, aqua chlori offic, iodtrichlorid 1:2090, cyanid of mercury (HgCy 1.0, NaCl 10.0, aqu. destill., 1500). oxycyanid mercury 1:1000, mercuric bijodurol (specially for disinfection of the lid edges in a concentration 4:1000). Recently formol 1:2000 has been warmly recommended, it having the property of antisepsis without irritating the eye as much as sublimat and producing less coagulation of the albumen of the tissues.

Before the antiseptic era, statistics showed that from 5 per cent. to 10 per cent. of eyes operated upon for cataract were lost through suppuration, and now less than 1 per cent. Operators differ greatly in the methods of applying antiseptics, as well as in the choice of the same. Some of them begin several days before the operation, with rubbing the edges of the eye-lids and washing out the conjunctival cul-de-sac. Others put an antiseptic bandage on a day before, but most of them begin directly before the operation to disinfect the edge of the lids and the conjunctival cul-de-sac, either by washing out the sac and wiping the edge ef the eye-lids, or through brushing and irrigation. Extremes have been reached as by one colleague who considered it necessary to asepticise the intestinal canal by giving calomel, salol, magnesia and bicarbonate of soda. He also washes out the tear ducts, the nose, and even the eustachian tubes, and considers it necessary on the evening before the operation to put an antiseptic band over the nose. It has been shown that it is impossible to remove all the germs from the conjunctival cul-de-sac, and Bach shows that the method of briskly rubbing the edge of the eye-lids and wiping off the conjunctiva with pledgets of cotton, etc., with sublimat, boric acid or salt water gives as good results. The eye should not be irritated before the operation by antiseptics, but rigid asepsis should be practiced.

The following methods are used in Bach's clinic: The preparations are made directly before the operation. The lids and face are washed by warm water and soap, and then wiped off with luke warm physiologic salt, or weak boric acid solution by sterile cotton pledget. The patient is then directed to wink for awhile, as through this the micro-organisms which are suspended in the conjunctival cul-de-sac are carried to the nose and the edge of the lids. After this mechanical cleansing of the edge of the eye-lids and irrigation is done, then the lid speculum and fixation by forceps: then the portion of the bulb upon which the cut is to be made is wiped off with cotton dipped in physiologic salt solûtion and the cul-de-sac dried with sterile cotton; then the operation is made. The instruments are rendered strictly sterile. He recommends the following methods: Boil in soda solution and then wipe all the cutting instruments with the following solutions: Absolute alcohol and ether ää and a few drops of amonia (Stroschein) by soaked cotton compress. After this put them from 5 to 10 minutes in a 5 per cent. carbolic acid solution. Then in a sterile luke warm physiologic salt solution until their use. Chibret's method is to lay the instruments in a 1 per cent. cyanid of mercury solution for ten minutes. Burchardt's method is to lay the instruments in a solution of 6.0 solveol, 0.1 lysol in 1000 water. Any instrument which comes directly in contact with the wound or is passed into the anterior chamber must be absolutely sterile, and no part of the instrument which touches the wound must be touched with the hand, the edge of the eye-lids or any of the fluids suspended in the conjunctival sac.

By the use of these methods he has operated upon many patients with chronic catarrhal conditions, with disease of the tear duct, finding healing results within 10 days, and within a year he has done 112 extractions of the lens with no loss through suppuration. He shows that the only absolute antiseptic is the hot iron. The watchword against suppuration is thoroughly strict asepsis.

Intra-ocular injections of sublimat have no therapeutic worth and the sub-conjunctival injection is of no more value than that of injection of physiologic salt solution. Sublimat vaselin and nitrat of silver vaselin are decidedly antiseptic; the yellow precipitate salve is less so. He claims that iodoform and boric acid ointments have no antiseptic effect. He recommends American vaselin for the basis of eye ointments. Antiseptics are of more importance for disinfection of instruments than action upon the germs in the conjunctiva, the edge of the lids and the bacteria in the tissues, but are necessary, as well as mechanical action of fluids, together with the greatest cleanliness. H. V. W.

A Handbook of the Diseases of the Eye and Their Treatment.

By Henry R. Swanzy, A. M., M. B., F. R. C. S. I. Sixth Edition. Small octavo. pp. 629. P. Blankiston, Son & Co., Philadelphia, 1897.

The fifth edition of this well-known handbook has been out of print for some months. The sixth edition, which has just appeared, is a large book, consisting of 629 pages, well-printed and well-illustrated. A perusal of this work shows that the revision has been thorough and up-to-date, there being numerous references to papers published as late as the fall of '96.

The pages in the first chapter of former editions on "Some Elementary Optics" have been omitted "to make room in the book for other matter." A resumé of optical laws, as well as of the anatomy and physiology of the eye, is usually appreciated by students, for whom this book is chiefly intended: on this account it is doubtful whether this change was a wise one.

The chief alterations in the new edition concern chapters XV, XVII and XIX.

Chapter XV, on Diseases of the Retina, has been re-arranged and grouped under the following subdivisions: 1. Alterations in Vascularity; 2. Inflammation; 3. Atrophy; 4. Diseases of the Blood-Vessels; 5. Injury by Strong Light; 6. Tumors; 7. Parasitic Diseases; 8. Detachment; 9. Traumatic Affections. The effect of electric light upon the eyes are given at some length and discussed under two headings: (a) Electric Ophthalmia, and (b) Blinding of the Retina.

Chapter XVII consists of a well-written and concise description of the eye in its relations to the brain and rest of the nervous system as accepted at the present time, *i. e.*, the disease of the eye and symptoms liable to accompany diffuse organic brain disease and diseases of the spinal cord, and an account of the functional derangement of vision. This chapter contains much new matter and is divided into five parts:

Part I treats of the ocular diseases and symptoms liable to accompany focal diseases of the brain under the headings: Heminopia. Alexia, Visual Aphasia, Dyslexia, Amnesic Color-Blindness, Visual Hallucinations and Mind-Blindness.

Part II treats of the ocular diseases and symptoms liable to accompany certain diffuse organic diseases of the brain. It gives the points of ophthalmologic interest which accompany Disseminated Sclerosis, Diffuse Sclerosis, General Paralysis of the Insane, the Various forms of Meningitis, Hydrocephalus, Infantile Paralysis, Paralysis Agitans, Encephalopathia Saturnina, Epilepsy and Chorea.

Part III treats of the ocular diseases and symptoms liable to accompany certain diseases and injuries of the spinal cord, including Tabes Dorsalis, Hereditary Ataxia, Myelitis, Syringomyelia, Thomsen's Disease, Acute Ascending Paralysis and Injuries to the Spinal Cord.

Part IV treats of Nervous Amblyopia or Nervous Asthenopia as accompanying three functional diseases of the nervous system—Neurasthenia, Hysteria, and Traumatic Neurosis.

Part V treats of the various forms of Amblyopia.

In chapter XIX, which treats of Diseases of the Orbit, the portion describing Tumors of the Orbit, as well as their Complication with Affections of the neighboring Cavities, has been treated of at greater length than in previous editions.

Throughout the book there are evidences of careful and complete revision. As examples of new or re-written paragraphs may be mentioned Measurement of the Degree of Astigmatism with the Astigmometer, Lental Astigmatism, Congenital Ptosis with Associated Movements of the Affected Eyelid During the Action of Certain Muscles, Ophthalmia Nodosa, Hyperæmia and Anæmia of the Retina, Pigmentation of the Cornea, Episcleritis Periodica Fugax, Lymphoma of the Conjunctiva and Tubercular Iritis.

Therapeutics and operations have not been forgotten in the revision. Two pages are devoted to the operative cure of myopia, and operations but recently reported are given—for instance, Kenneth Scott's Operations for Ectropion and Hugo Wolff's Operation for Congenital Ptosis by Advancement of the Levator Palpebræ Superiosis. The Thymus Gland Treatment of Exophthalmic Goitre is mentioned, and Darier's method of Subjunctival Injection of Corrosive Sublimate described.

The present volume warrants a continuation of the favorable impression which former editions have created. An author's style has much to do with the popularity of a textbook, especially one designed for students; it has a direct influence upon the facility with which the contents can be assimilated and acquired by the reader. In this respect, the book before us resembles former editions—it makes easy and delightful reading. The volume deserves to be and is certain to remain a favorite with the student and a safe and authoritative guide to the general practitioner. C. H. M.

Outlines of Ophthalmology.

Hosch, Friedrich, Basel. *(Grundriss der Augenheilkunde.)* Urban & Schwarzenberg, Leipzig, 1897.

This book of 500 pages is more than that for which the author designed it. Intending to write a book for beginners and students in ophthalmology he has succeeded in making one which is more than a brief outline sketch of this division of the healing art. It contains much that may be read by practitioners with pleasure and profit, while for students who are conversant with German and wish to inform themselves at once of the elements of eye work, and authoritative German views upon the same, this is an excellent book.

It contains a number of illustrations. Type and paper are good. The style is not extremely heavy, although "German," but is clear, concise and so plain as to be easily understood even by the uninitiated.

Sufficient of the science of optics is given for the beginners' need. Ocular refraction and its anomalies occupies an early part of the book, and frequent references are made to this throughout the text.

The author's greatest achievement is in his very practical handling of diseases of of the eye. The pathologico-anatomic part of the subject is dispatched with as much brevity as can be considered consistant with its importance. The reviewer thinks the discussion of the relation of the nasal cavities and accessory sinuses an unusually commendable and pertinent feature. Eye operations are given the final section and are convenient for reference.

If the field were not so fully occupied, it might be hoped that this publication would receive an early English rendition. H. V. W.

A Hand Book of Physiologic Optics.

v. HELMHOLTZ, H. *(Handbuch der Physiologischen Optik.)* Verlag von Leopold Voss, Hamburg und Leipzig, 1896. Edited by A. König.

The second edition of this monumental work appeared in full in November, 1896. The first papers of Helmholtz upon the subject appeared 1856, 1860, and 1866, the work being re-edited and published as a whole in 1866. The edition being exhausted, Herman v. Helmholtz re-wrote the entire work in 1885, being assisted by Arthur König. The death of v. Helmholtz in 1894 did not see the second edition completed. König has brought forth the work in the entirety, his preface being written in October, 1896. The work is a fitting monument to that great master of German physical science and to his assistants, particularly König. It is impossible to even attempt a description of the book in these pages. The work covers the whole ground of physiological optics, beginning with the anatomy of the eye, and proceeding through physiological optics, dioptries of the eye, and the physiology of vision; giving in the 975 pages of text the only complete study of the subject extant. The index is most complete, in addition to which there is given a resumè of the principal literature to the end of 1894, thoroughly systematized under the various headings, having altogether 7,893 titles of articles under the years of publication. The work is illustrated by 254 cuts in the text and 8 plates. To the student of physiological optics, as well as to the working ophthalmologist, Helmholtz's work is absolutely indispensable. By no other means is if possible to find such a complete resumè of any part of the subject of optics as is here given. It is to be hoped that the editor and publisher may see fit to bring forth the work in English so as to open up this mine of information to those who do not read German. H. V. W.

Outlines of Ophthalmology.

STILLING, J., Strassburg. *(Grundzüge der Augenheilkunde.)* Verlag von Urban and Schwarzenburg, Wien and Leipzig, 1897.

With 1 colored plate and 118 wood cuts, 368 pages. Another text book is thus added to the vast mass of German literature upon the eye. The illustrations are largely diagramatic, but few original, some being hardly up to date, such as the old style of Javal-Schiötz ophthalmometer and the perimeter. The ink is gray, and hence the cuts do not show well. The paper is somewhat glazed, and together with the poor quality of ink, makes difficult reading. The colored plate on page 67 showing the color system of the normal, of the red-green and blue-yellow color-blind, is an excellent feature. Sixty-seven pages are given to physiologic optics and about thirty to methods of examination, the anomalies of refraction being considered in about thirty-five pages. Of the objective methods of examination of the refraction, preference is given to examination by the erect image, and skiascopy is dismissed by a sentence. Thirty-six pages are given to disturbances of the muscular system. The balance of the book is made up of treatment. Plastic operations, especially the older forms, are freely described. Transplantation of skin grafts is unfavorably considered in one sentence. Older forms of operations on the ocular muscles are briefly described. Cataract extraction is given a larger space. The index is decidedly incomplete, occupying less than three pages. The book is evidently intended to occupy a position that is amply filled by a large number of other works of the same nature. H. V. W.

The Helmholtz Lectures Upon the Electro-Magnetic Theory of Light.

KONIG, A. and RUNGE, C., editors. Vorlesung über die Elektromagnetische Theorie des Lichts. Vorlesungen über Theoretische Physik von H. von Helmholtz. Band V. Verla gvon Leopold Voss, Hamburg und Leipzig, 1897.

Volume V. is the first to be published of a series of six volumes of Helmholtz's lectures upon theoretic physics; the others will follow. These lectures have been stenographically reported by Dr. Borchardt and have been edited by König and Runge. The work was begun in the winter of 1892–93, and was continued to the death of Helmholtz in 1894, whereupon Prof. König decided to publish them. Volume V. of this work includes 370 pages, largely of abstruse formula and calculation. In the preliminary section is included history of the emissionary and undulatory theory of light and explanation of the electrical magnetic theory and magnetic polarization. The first part deals with elastic vibration in continuous media. The second part upon electro-magnetic vibrations. The third part deals with spherical waves. The fourth part with refraction of light. The fifth part with geometrical optics and the sixth part with polarization and dispersion of light. To the student of theoretic optics, and to the mathematician the book will no doubt prove of the greatest interest. It is replete with mathematical formulæ and very difficult reading for the average practitioner.

H. V. W.

New Test Types.

PFLUGER. Sehproben und Sehprüfung. Optotypi Pflüger, 2. Auflage. Basel und Leipzig, 1896. Verlag von Carl Sallmann.

These vision tests are prepared by means of Snellen scales and permit very fine precision in the shortest possible time. Of great advantage is the fact that when the figures are reflected they do not change their shape. Since the detection of intentionally false answers is easy, the Pflüger charts are well adapted for examinations by army surgeons and accident insurance examiners. For near vision a Snellen chart is added, giving a scale of letters that permits of even a finer test than do the Snellen and Jäger charts. The Pflüger optotypes are, however, of practical use, for they find applications in photometric examinations made in connection with school hygiene. If, for example, the vision in a school room sinks to $^1/_2$, this means that the illumination is but $^1/_4$ the normal amount, and demands an interruption of exercises in reading and writing. The print and general appearance of these optotypes of Pflüger are excellent. H. V. W.

The Practical Physician as Oculist.

HELL, Ravensburg. (*Der praktische Arzt als Augenarzt.*) Verlag von Otto Maier, 1897.

In this pocket manual for physicians and students the author brings up practical points from many years work. The little book is clearly written, readily understood, and interwoven with jovial humor. The general practitioner is given good advice regarding eye disease and his limitations in place of the oculist are defined. This field of usefulness is limited, although the author explains conjunctival, corneal and iris disease, including irido-cyclitis and sympathetic ophthalmia, as well as glaucoma and glioma of the retina. Students who may think that this work is an easy guide to the acquisition of ophthalmic knowledge must remember that it gives a very small amount of such, and they should not depend upon such books for all information necessary to the treatment of even common diseases of the eye. H. V. W.

Atlas of Ophthalmoscpoy.

OELLER, J. (*Atlas der Ophtalmoskopie..*) Dritte Leiferung. Verlag von J. F. Bergmann, Wiesbaden, 1897.

In the third part of Oeller's Atlas of Ophthalmoscopy the standard of work is continued. The 15 plates with descriptive text in German and English are excellently reproduced. The previous criticism of the editor concerning the yellowish coloring of the illustrations still obtains. Several of the plates, notably that of Tab. XI, Staphyloma Posticum Anulare; Tab. XIV, Sclerosis Vasorum Chorioideæ, Tab; XVIII, Tumor Chorioideæ, and Tab. XIX, Ruptura Chorioideæ seem too diagramatic. Many of the others are beautiful. On the whole, for teaching purposes, this atlas is probably the best one in existence. H. V. W.

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ILLUSTRATIVE CASES SHOWING THE INDICATIONS FOR ENUCLEATION OF THE EYEBALL WITH MACROSCOPIC AND MICROSCOPIC PHOTOGRAPHIC ILLUSTRATIONS FROM SPECIMENS.

BY H. V. WÜRDEMANN, M. D.,

MILWAUKEE.

OPHTHALMIC AND AURAL SURGEON TO THE CHILDREN'S HOSPITAL: TO THE MILWAUKEE COUNTY HOSPITAL FOR THE CHRONIC INSANE: DIRECTOR TO THE WISCONSIN GENERAL HOSPITAL, ETC.

[Illustrated.]

(Read before the Milwaukee Medical Society. April 7, 1896.)

The classical indications for enucleation of the eyeball, are: (1) malignant growths, such as carcinomata, sarcomata and gliomata; (2) danger from sympathetic ophthalmitis; (3) pain, such as is caused by absolute glaucoma; (4) cosmetic purposes, such as staphylomata and ectasia bulbi totalis; (5) panophthalmitis where evisceration is not indicated; (6) cases where there are several of the above reasons.

About three and a half per cent. of all larger eye operations in hospital or clinical practice are enucleations; in private practice, the percentage is less. It is my purpose in the following to give examples of typical cases, showing macroscopic and microscopic sections of the specimens and photographic illustrations, together with their clinical histories.

The occurrence of malignant tumors within the eyeball gives occasion for about 10 per cent. of enucleations, The following is a recent case from my practice.

CASE I.—SARCOMA OF CHOROID. DIAGNOSIS IN INCIPIENCY. ENUCLEATION. RECOVERY.

Mrs. C., aged 48, of Whitewater, Wis., farmer's wife, (referred by Dr. Furlong,) negative general history, except neurasthenia and bowel trouble; came on account of defective vision in the right eye for three months, which had been struck by a stick about six months before; no history of pain or inflammation. *Stat. praes.* anemic and neurotic. Eyes: Left V. 6/VI, normal in every respect; right V. 6/LX; V. F. hemianopic, only the lower half being preserved. (See Fig. 1) Tn. Imperfect reaction of pupil to light from above.

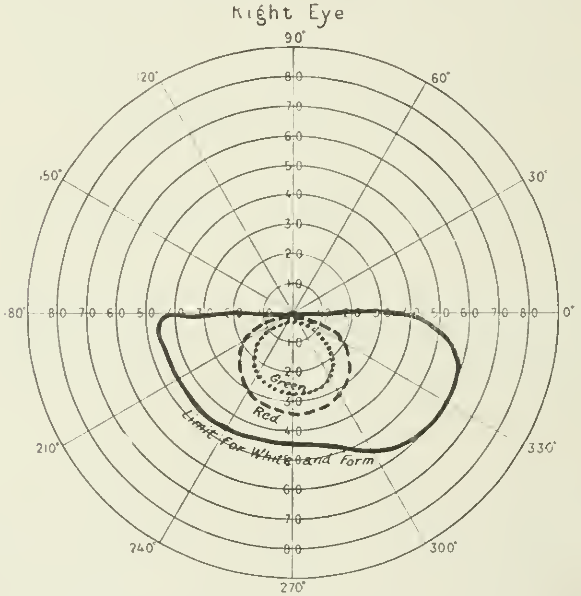

Fig. 1. Hemianopic Visual Field in Sarcoma of the Choroid.

By oblique examination, the pupil being dilated, a rounded bluish mass was visible in the lower part behind the iris. Direct illumination by the ophthalmoscopic mirror showed the retina detached at lower half, beginning under optic disc. Under this there was a greenish area, due to the sub-retinal exudate. The whole lower portion of the field was occupied by a rounded purplish mass, over which coursed blood vessels; there being a well defined space between the apex of the tumor and the retina. (See Fig. 2.)

Despite the fact that the eye had no pain, little tension, and could yet see, the ophthalmoscopic picture was so perfect that I did not hesitate to make diagnosis of intra-ocular tumor, of probable sarcomatous nature. After some correspondence with her physician, she returned to me three weeks later, when the vision was found reduced to counting of fingers at three meters, with visual field and the iris reaction more hemianopic. The patient had no pain, although the tension was now perceptible. Enucleation under ether was done April 20, the location of the tumor being marked by a black thread in the conjunctiva. Patient had uninterrupted recovery, and was fitted later with an artificial eye. Since the operation she has had no symptoms.

Microscopic and macroscopic specimens and photographs were prepared from the eyeball, according to the methods to be shown in the latter part of this article.

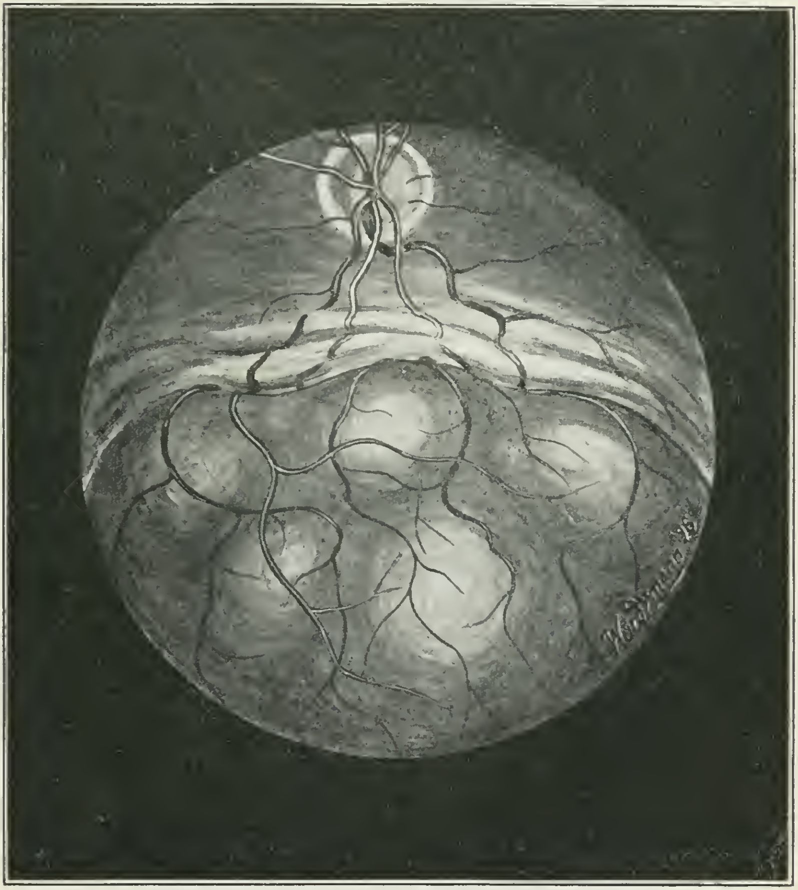

Fig. 2. Fundus Oculi by Direct Ophthalmoscopy in Sarcoma of the Choroid.

The macroscopic specimens are of an eyeball normal in size and shape, and in relation of the ocular structures, except as shown. Especially noticeable are the venæ vorticosæ and the choroidal fetal cleft. (See Fig. 3.) This is the larger section, the eye being cut a little out of the median line, although through the center of the tumor. The latter is the size of a large pea, arising from the choroid near the ciliary body, at the lower portion. The growth is white, although covered by the dark pigment coat of the choroid and the retina. It has as yet disturbed none of the intimate relations of the ocular structures, except the choroid and retina. The latter is detached back to the optic disc, this space being filled by a subretinal exudate which in section appeared of a colloid nature, and of a firmer consistency than the vitreous.

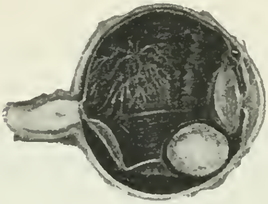

Fig. 3. Lateral half of eyeball with sarcoma of the choroid, showing normal relations of the ocular structures and the tumor.

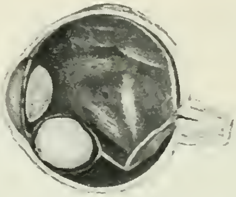

Fig. 4. Lateral half of eyeball with sarcoma of the choroid, showing extensive retinal detachment and the tumor.

In the opposite section, the retina is extensively detached by reason of the exudate, and thrown in folds. It retains its normal appearance in other respects, and the macula lutea shows distinctly to the naked eye. (See Fig. 4.)

The microscopic section shows that the tumor is made up almost entirely of typical non-pigmented, small round sarcoma cells, there being but little connective tissue stroma. The choroidal tissue itself is entirely replaced by the new formation. The sarcoma cells are

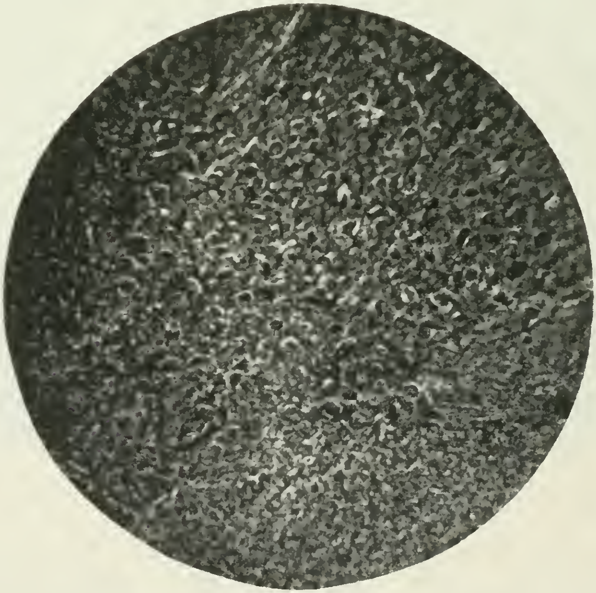

Fig. 5. Microscopic section of sarcoma of choroid. (Enlarged aboutt 1000 meters.

limited to the tumor itself, none being found in the vitreous or other structures, which retain their normal microscopic appearances. The subretinal exudate is of a homogenous colloid nature. (See Fig. 5.)

Sarcomatous growths of the choroid are the most common form of intra-ocular tumors. They are usually of the small round cell, pigmented variety, of which I have seen a number, the white form being of rare occurrence.

Case II.—In another case, beginning as sarcomatous intra-ocular growth, the eyeball was enucleated for "inflammation" four years ago by a physician. Neither the patient nor the family were aware of the malignant nature of the disease until a tumor appeared in the orbit, so the eyeball was probably not examined or a diagnosis made. Three years I exenterated the orbit, yet it was too late, for metastatic multiple sarcomata appeared in the liver, which became of enormous size, and in other organs of the body, the patient dying of metastatic tumor of the brain three and a half years after the exenteration. On account of religious scruples, no autopsy could be obtained.

Case III.—In a child with glioma of the retina, which was first seen when ophthalmoscopic examination was possible, and enucleation advised, but refused by the parents, enucleation was done three months later. The tumor then completely filled the eyeball, and upon macroscopic examination glioma cells were found in the cut edge of the optic nerve, although it was divided as far back as possible. Recurrence of the growth occurred in the orbit, which was extenerated about two months after the enucleation. A few weeks later the child died with brain complications.

These cases have been briefly cited for contrast, as they exemplify the necessity of an early diagnosis and radical treatment, even to the sacrifice of an eye that it is not painful, and yet has fair vision as in the foregoing, as the prospect of a fatal termination is assured by delay. It may be well to remark in passing, that the literature of intra-ocular growths seldom shows an instance in which such an early diagnosis was made as in Case I.

Sympathetic ophthalmitis or its prophylaxis furnishes an excuse for the greatest number of enucleations, fully 60 per cent. Such cases range from penetrating wounds of the ciliary region, to injuries involving entire destruction of the globe. Sympathetic disease may be either sympathetic irritation or inflammation. It may arise from three weeks to fifty years after the injury to the exciting eye. Being so often implored to save the eyeball in cases where the ciliary region has been wounded, and notwithstanding the fact that such injuries sooner or later give rise to that fearful disease, surgeons have sometimes acceded to the wishes of their patients, against their better judgment, and often to their sorrow. Many patients will consult several physicians before submitting to operation, and hang on to the last hope for saving the eyeball. A supposedly conservative opinion is often given, especially by ill-informed persons, or by a consultant who, for the sake of a different opinion from the previous one, has been less emphatic in his statements as to the probability of danger. Many such cases have been permitted to become blind through this form of negligence. Most oculists of experience are able to substantiate this statement. Under this heading, I cite four cases of varying severity.

CASE IV.—EXTENSIVE LACERATION OF EYEBALL THROUGH INJURY OCCASIONING CONSIDERABLE LOSS OF VITREOUS. IMMEDIATE ENUCLEATION. RECOVERY.

Mrs. T., of Monroe, Wis., (referred by Dr. F. M. Confer) while carrying a lighted coal oil lamp in the early morning, fell down a flight of stairs, the light going out, but the chimney breaking. Falling upon the latter, she received a large lacerating wound of the right side of the face, which divided the upper and lower lids and perforated through the sclerotic and ciliary region of the right eye; also dividing the belly of the internal rectus muscle. Patient was seen within an hour by Dr. Confer and the wound immediately stitched up, two stitches being at the same time taken in the sclerotic. An unfavorable prognosis as regards the sight, and necessity for removal of the eye was given, and I was called by telegram, arriving there that evening. The eye was enucleated under ether narcosis at 11 o'clock that night, the capsule, muscles and the conjunctiva being gathered up in a pouched suture, a satisfactory stump being obtained and the lids restored by fine stitching.

Examination of the enucleated eye shows it shrunken fully one-third. On section the ball appears to be nothing but a pouch full of an extensive blood clot proceeding from the ciliary region. The vitreus has almost entirely escaped and is replaced by blood.

CASE V.—TRAUMATISM OF CILIARY REGION WITH RAPID DEVELOPMENT OF SYMPATHETIC IRRITATION (TWO WEEKS AFTER INJURY TO OTHER EYE). RECOVERY OF NORMAL VISION.

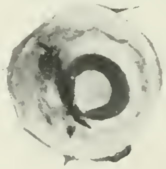

Fig. 6. Anterior aspect of enucleated eyeball, showing wound of ciliary region.

Mr. P., aged 55, farmer, of Colby, Wis., (referred by Dr. Freeman) cut his right eye by the breaking of an axletree, which was followed by pain and partial blindness, although perception of light remained. For a week before examination the vision of the left eye had been failing, until it was reduced to 6/XXXVI; the visual field normal, but colors confused. The left optic disc was hyperemic: the injured right eye retained sufficient vision for counting of fingers at one meter. There was a cut through the ciliary region half an inch long, extending from the inferior to the external rectus, in which the iris had become incarcerated in the healing process. (See Fig. 6.)

The lens capsule was injured, and ophthalmoscopic examination could not be made. The eyeball was tender, but not specially painful and stood exposure to light fairly well. On the day of examination the eye was enucleated, and in two days the vision of the sympathizing left eye grew better, until two weeks later he could see to read small print with his presbyopic glasses, the vision for distance being 6/XII. He now sees as well as ever, and pursues his vocation.

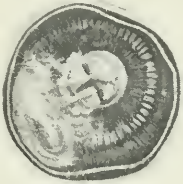

Fig. 7. Posterior aspect of anterior half of eye, showing extensive destruction of ciliary region and lens with exudate in vitreous.

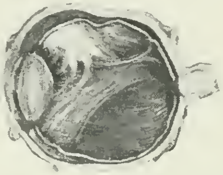

Fig. 8. Longitudinal section o eye from another case, showing similar appearances.

Section of the eye made transversely shows anteriorly a displaced, ruptured lens; extensive destruction of the ciliary region and iris, blood clots and purulent exudate in the vitreous. (See Fig. 7.)

The posterior segment gives evidence of beginning suppurative chorio-retinitis, which is substantiated by microscopic examination of the retina, choroid and vitreous.

CASE VI.—TRAUMATISM OF CILIARY REGION WITH LATE DEVELOPMENT OF SYMPATHETIC OPHTHALMITIS AND BLINDNESS (FOUR YEARS AFTER INJURY TO THE OTHER EYE.) ENUCLEATION WITH CESSATION OF SYMPATHETIC SYMPTOMS. IRIDECTOMY, WITH RECOVERY OF PARTIAL VISION.

J. C., aged 12, of Britton, Ontario, Canada, had been injured in the left eye by a knife blade five years ago, with resulting blindness from irido-cyclitis, with occlusion of the pupil. Was treated by poultices and the inflammation reduced. Sight of the right eye remained good until a year before examination, when an attack of pink eye was about the neighborhood, the right eye became inflamed and vision diminished. No special attention was given to this, and he was again treated by poultices by an old woman. When brought to me he could only see large white objects, such a newspaper, before his face, and could not walk about by himself. In the right eye there were the effects of sympathetic irido-cyclitis, in occlusion and exclusion of the pupil. The left eye was shrunken and hyperemic. Both eyeballs were tender, the blind eye exceedingly so. Enucleation was done, with improvement of symptoms, and later an iridectomy was made on the better eye with improvement of vision to the counting of fingers and the seeing of very large test letters at two meters, and the perception of all colors.

The enucleated eyeball prepared for macroscopic examination shows extensive disorganization of all the orbital contents, with fibroid and calcareous degeneration. The microscope corroborates the gross appearances.

CASE VII.—SYMPATHETIC OPHTHALMITIS ARISING FORTY YEARS AFTER INJURY, CAUSING IRIDO-CYCLITIS AND OCCLUSION OF THE PUPIL IN THE SYMPATHIZING EYE, THE EXCITING EYE HAVING UNDERGONE PHTHISIS BULBI. ENUCLEATION OF THE STUMP AND IRIDECTOMY, WITH RECOVERY.

S. McL., aged 48, of Berlin, Wis., brought to me by Dr. John Walbridge, with irido-cyclitis of right eye, vision reduced to counting of fingers at three meters; history of several attacks of iritis within two years, with partial recovery; considerable pain five weeks ago. Patient had been injured in the left eye in childhood, and examination of this revealed a very small, hard and tender stump. Patient was mentally defective from birth and no clear history could be gained of the injury. At examination, the right eye showed occlusion of the pupil from posterior synechia with punctate spots of Descemet's membrane, showing the existence of a previous attack of iritis. The tension was *minus* 1. The stump of the left eye was enucleated at once, with resultant improvement in right, which was later operated upon by iridectomy, giving resultant improvement to counting of fingers at five meters, and no recurrence of the iritic attacks.

The shrunken globe is about the size of a large pea. The section shows that the tissues have undergone calcareous and fibroid degeneration, which is corroborated by microscopic examination. The lens is of bone-like hardness.

The *pain of absolute glaucoma* renders enucleation sometimes necessary. A marked example of this is the following:

CASE VIII.—ACUTE HEMORRHAGIC GLAUCOMA FOLLOWING IRIDECTOMY IN AN EYE WITH ABSOLUTE GLAUCOMA. ENUCLEATION OF EYEBALL. OTHER EYE RELIEVED BY IRIDECTOMY.

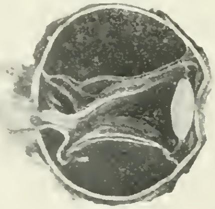

Fig. 9. Section of eyeball in post-operative hemorrhagic glaucoma.

Mr. H., aged 70, Waupaca. The vision of the right eye had been failing for the last year and a half and he had an attack of severe pain in both last spring. The left eye had been blind for ten years, and at times had been painful. He had been subject to rheumatism, otherwise in good health. *Stat. praes.* R., V. Light perception.

small amount of vision by turning the eye. V. F. taken with large white object shows it to be distinctly hemianopic. There is hemianopic pupillary reaction. Tension *plus* 2. There is a cupping of the optic nerve equaling 4 D. L. V. Nil., tension *plus* 3, no pupillary reaction, and the lens cataractous. Both eyes tender to touch, and having anesthesia of the cornea. The anterior chambers very shallow. Diagnosis of double glaucoma with no hope of recovery of vision was given, but in order to avoid the attacks of pain, iridectomies upward were done. This was attended by much bleeding. Healing progressed well in the right eye, but in the left after ten days, a severe attack of inflammation supervened: the eyeball became intensely hard, and there was such great pain that enucleation was necessary. Patient has made recovery since, and gained slight vision in the right eye.

Examination of the bisected eyeball shows a cataractous lens, extensive detachment of the retina, cupping of the optic nerve and large blood clots between the retina and choroid. (See Fig. 9.) Microscopic examination shows this mass to be a true blood clot, composed of red blood corpsules with some leucocytes.

For *cosmetic purposes*, I prefer to make one of the forms of staphyloma operation, or to do evisceration of the eyeball with implantation of a glass globe, as these operations leave large stumps which, in the case of children, are not followed by atrophy of the orbit, and also allow for better fitting of the artificial eye. Still there are occasions when the eye should be enucleated, as in the following:

CASE IX.—CELLULITIS OF ORBIT IN EYE BLIND AND DISFIGURED BY LEUCOMA AND PTERIGIUM. ENUCLEATION AND PROTHESIS.

Mr. W., aged 38, school teacher of Milwaukee, (referred by Dr. Schulz). The right eye was blind from a very large pterigium and a leucoma following ulceration of the cornea from chicken-pox in childhood. He came to me on account of exophthalmus and great pain, having a temperature of 101 degrees. Diagnosis of cellulitis and orbital abscess was made. The same day an incision was made into the orbit for drainage, but proved insufficient and, yielding to the entreaties of the patient, to get rid of such an ill-looking eyeball as well as to obtain free drainage, I enucleated the globe. There was ultimate recovery, after which artificial eye was satisfactorily fitted. Specimen showed practically normal eyeball, the remains of the pterigium and the leucomatous cornea are to be seen. Under indication 6, Case XI., I cite another instance.

In *panophthalmitis*, where the suppuration is locked up in the eyeball, evisceration is perhaps, indicated. Yet the disputed question of enucleation and evisceration is not determined. Anyone who has done a number of eviscerations successfully, and yet had in the last one sympathetic ophthalmitis follow, will return to enucleation; and anyone who has had many favorable enucleations in pan-ophthalmitis, and has had meningitis perhaps, follow the last operation will, in the future, be apt to return to evisceration, or even the formerly recommended incision of the pan-ophthalmitic eye.

CASE X.—PAN-OPHTHALMITIS AND ORBITAL CELLULITIS.

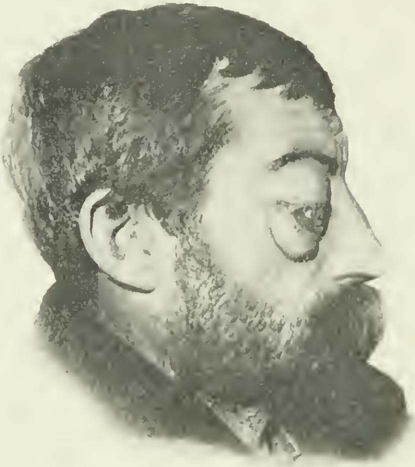

Fig. 10. Panophthalmitis and Orbital Cellulitis.

Mr. W., aged 32, of Milwaukee, (referred by Dr. Nobles) while scuffling, was kicked in the eye by a heavy boot. Was sent to me three weeks later, with appearance as shown in the photograph, (see Fig. 10) orbital cellulitis, panophthalmitis with protrusion of the eyeball, suppuration from a vent in the remains of the cornea, and a large ill healed cut in the lower lid, producing extensive ectropion; temperature 103 degrees. Ice compressing first used, but his temperature rose. After three days the remains of the eyeball were enucleated, in order to obtain free drainage. Temperature went up to 105 degrees and pulse became very weak. One week later temperature and pulse normal. Suppuration continued from orbit for several weeks, but ultimate recovery ensued.

The remains of the enucleated globe can hardly be distinguished as an eyeball, so great has been the result of the inflammation. The sclerotic, the nerve and its sheaths, are thickened many times. The contents of the sclerotic capsule are filled with a degenerated mass, which microscopic examination shows to be of blood, pus and fibroid tissues. All the separate structures of the eye have lost their individuality. The vitreous and lens have come out through the large corneal ulceration. (See Fig. 11.) Microscopic examination shows the lymph spaces greatly distended and filled with purulent exudate;

the vitreous replaced by blood and pus. No bacteriologic examination was made.

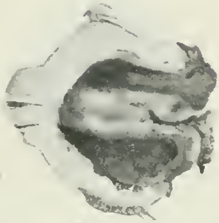

Fig. 11. Section of panophthalmitic eyeball.

In many cases there are several of the foregoing reasons for enucleation. The following is a marked example:

CASE XI.—SYMPATHETIC OPHTHALMITIS TAKING COURSE OF ACUTE GLAUCOMA IN SYMPATHIZING EYE. ENUCLEATION WITH RECOVERY OF USEFUL VISION.

Mrs. W., of Chicago, aged 51, (referred by Dr. Gray). History of erysipelas with inflamed left eye, which was treated with poultices by a homeopath five years before. Subsequently an iridectomy was done by another homeopath, during which the lens capsule was probably injured, being followed by cataract, irido-cyclitis and loss of sight. The right eye has been inflamed at times during the last few months, when the vision was somewhat diminished and she saw rainbow colors about objects: she had been a rheumatic subject for ten years. *Stat. praes.* The vision was 6/VIII for the right eye, and nil for the left. Both eyes were tender to the touch. The visual field of the right eye was constricted, the retinal vessels being tortuous and dilated, the nerve much cupped. The anterior chamber was shallow, and there was slight tension. The left eye was slightly inflamed, the iris congested and bound down to an opaque lens. Patient consulted me in regard to having cataract removed from the left eye, and was amazed when I told her that this eye was a dangerous object and should be enucleated, on account of it causing sympathetic trouble on the other eye. She refused any treatment and consulted an oculist, obtaining a different diagnosis and prognosis: in ten days, however, she returned to me with both eyes badly inflamed, the right having tension *plus* 3, the anterior chamber very shallow, the pupil irregularly dilated and the vision reduced to less than counting of fingers, on account of opacity of the media: in short, with acute glaucoma. As I believed that this was simply an exhibition of sympathetic inflammation proceeding from the blind eye, I advised an immediate enucleation of the latter, which was done, and the next day iridectomy was made on the right eye, with the result of reduction of the inflammation and restoration of the sight. She has had a rheumatic attack lasting nearly a month, without glaucoma or any other eye disease except, since that time, I have treated her for dacryo-cystitis, with resulting cure. The reasons for enucleation in this case were: 1, danger from sympathetic ophthalmitis: 2, pain: 3, cosmetic reasons,

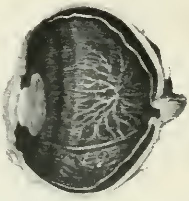

Fig. 12 Lateral half of glaucomatous eyeball, causing sympathetic ophthalmitis; taking the form of glaucoma in the other eye.

Examination of a section of the blind eye shows a flattened and somewhat shrunken globe, the retina and choroid atrophied, the venæ vorticosæ and the choroidal cleft showing distinctly, the vitreous clear and free from connective tissue changes. The lens has undergone calcareous degeneration. The posterior chamber is obliterated and the optic nerve has the characteristic glaucomic cupping.

The microscopic specimens here presented are prepared in the ordinary way, but as the macroscopic are seldom, seen, it might be well to explain the method of preparation.

Wash blood from the enucleated eye and place in 5 per cent. solution formalin for a few days; wrap in gutta percha tissue or wax paper, freeze in mixture of rock salt and chipped ice. Cut with razor or scalpel. Place for 24 hours in a 33 per cent. solution of glycerin and water; then in 50 per cent. glycerin and water for 24 hours more. Mount in special glass jar, cell downward, in glycerin jelly (and remove bubbles by pipette) which is made in the following manner: Soak 1 oz. "Gold Label" gelatin in 8 ozs. water for 24 hours; add shells and whites of two eggs and boil over water bath for 20 minutes, stirring constantly: filter and add equal amount of glycerin; add a few drops of carbolic acid to preserve until wanted for use. Expose to fumes of formalin under bell jar for 24 hours to harden the jelly permanently. Seal cup by cementing on the glass cover.

Wishing to exactly reproduce the eye sections, I endeavored to have photographs made, but found that no ordinary exposure would sufficiently elaborate the detail. When it is borne in mind that the bottom of an half eye is nearly half an inch from its cut edge or periphery, it is seen that these lie in different planes, and no ordinary lens or exposure will give a sufficient depth of focus for proper expression of the detail in the negative or print. Such may only be obtained by exceedingly long exposures, the use of the smallest diaphragms, and a rectilinear lens.

Accordingly after many trials, the specimens in the jars were exposed to bright sunlight from six to eight hours, a copying camera being used with the smallest diaphragm, a deep orange cell made expressly for the purpose being placed before the objective in order to filter out the heat and non-actinic rays, An orthochromatic plate was used in the holder, and the specimens enlarged one-third. The backgrounds were stopped out in the negative, and the photograph (a platinum print) reproduced (reduced one-third) by the photo-tint process (Binner Engr. Co., Chicago), with the excellent result seen in the accompanying figures. Such faithful adherence to the natural appearance of the specimen could not be secured by the brush of the artist.

128 Wisconsin Street.

A CONTRIBUTION TO THE BACTERIOLOGY OF THE NORMAL CONJUNCTIVAL SAC.*

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(From the Bacteriological Laboratory of Guy's Hospital.)

The cutaneous surface of the human body has been shown by many observers to be the temporary habitat of numerous varieties of bacteria—including many organisms which are pathogenic to man—desquamated epithelium, *plus* the various secretions and excretions, forming a sufficiently nutrient medium for their life and growth. The same conditions hold good with regard to exposed mucous surfaces in general, and in this respect the conjunctival sac is no exception.

As the presence of organisms in this situation, especially those which are known to be pathogenic for man, must have a most important bearing upon operative procedures involving the eye and its appendages; and, moreover, as bacteriology does not seem to have received that consideration from the ophthalmic surgeon which its importance demands, a short account of my observations and experiments in this connection may be of some value as a contribution to our knowledge of the subject.

Historical.

Before detailing the technique of these experiments and the results obtained therefrom, it is necessary to mention previous researches on this subject—which for the most part appear to have been conducted on the following lines:

1. To determine the average percentage of sterile conjunctival sacs.

2. To determine the presence or absence of those commoner pathogenic organisms—the staphylococcus pyogenes aureus or albus, and the streptococcus pyogenes.

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*See also report of the Scientific Grants Committee of the British Medical Association.—*British Medical Journal, July 18, 1896.*

3. To test the pathogenicity of the various organisms, when isolated, by means of inoculation experiments performed upon, or in, a rabbit's cornea.

Fick examined 49 healthy eyes and found the conjunctival sac sterile 6 times. In another series of experiments he found the sac sterile 36 times out of a total of 50 observations. Some of his conclusions, however, appear open to question, for he has some difficulty in identifying an organism which he says may be, either the B. subtilis, B. of xerosis or an aerial hypha. He also records the presence of the Bacillus tetani, B. fluorescens liquefaciens, and the Proteus vulgaris. Among the cocci he isolated the staphylococcus aureus, micrococcus candicans, a streptococcus and the sarcina lutea.

Gayet demonstrated the presence of the staphylococcus aureus in the healthy conjunctival sac.

Gombert isolated 12 species of bacteria from the normal conjunctival sac, which he divides into two classes. The first contained 9 species; these were non-pathogenic to the rabbit's cornea; the second, 3, which were freely pathogenic, for when inoculated between the layers of the cornea they produced a white opaque infiltration, lasting two to five days, and then clearing completely.

Marthen described 16 varieties of cocci and 2 of bacilli, which he had observed in the healthy conjunctival sac. The cocci included the staphylococcus aureus and albus, but never a streptococcus.

Franke found the staphylococcus aureus or albus 10 times out of a total of 115 observations.

Morax states that he has never found a staphylococcus aureus or a streptococcus, but does not give any precise data as to the number examined.

Lachowicz examined 63 normal conjunctival sacs from 32 individuals; of these he found the sac sterile in 44. Among the organisms isolated from 19 sacs, he records the staphylococcus pyogenes albus and the streptococcus pyogenes.[*]

Material.

The individuals from whom I have collected material have been as varied as possible with regard to age, sex, social status and environment—especially the last named particular—for it is obvious that in the case of an exposed mucous surface, such as the conjunctiva, its microbic lodgers are, for the most part, derived from the medium by which it is surrounded—the air—or conveyed to its surface by the fingers, etc., of the host.

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[*] Since writing the above, a paper by Randolph has appeared in the *Archives of Ophthalmology*, (1897, No. 3,) in which he states that the staphylococcus epidermidis albus (Welch) was isolated from 85 sacs out of 100 examined, and he therefore regards this organism as a regular inhabitant of the normal conjunctival sac. As will be seen further on, my observations do not confirm this point.

One series of examinations amounting to 24 observations was made of the conjunctival sacs of the inmates of two wards in a large Poor Law infirmary. In another series of observations, the secretion was obtained from the conjunctiva of workers in a bacteriological laboratory, but by far the greatest number of observations was made of the conjunctival sacs of patients who were suffering from errors of refraction, unaccompanied by any pathological condition of the conjunctiva, lachrymal sac, or ciliary margins.

Methods and Technique.

The plan most generally adopted to determine the presence, or otherwise, of organisms in the conjunctival sac, has been to gently stroke the surface of the conjunctiva, especially in the lower fornix, with a sterile platinum loop, and with the fluid thus collected, to inoculate a tube of nutrient bouillon. Some observers, notably Gombert and Marthen, inoculated tubes of fluid gelatin or agar-agar, and at once poured plates. Such methods are, however, somewhat fallacious, and Morax made a decided advance when he ran some liquid gelatin into the conjunctival sac by means of a small pipette, allowed it to remain there for a few seconds, withdrew it by the same means, planted it in tubes of melted gelatin or agar, and then poured plates.

In the first series of 52 eyes (26 individuals) which I examined for the express purpose of determining the percentage of sterile conjunctivæ, I adopted the platinum loop as an easy and convenient method of removing small quantities of the conjunctival secretion; and as my previous work on the xerosis bacillus had shown me that there were objections to agar or gelatin media alone for this class of work, I planted my material on the sloped surface of inspissated ox or sheep serum, inoculating as a rule three and sometimes four tubes with as many separate loops of conjunctival fluid. Often one, sometimes all, of the tubes planted in this manner, remained sterile. If a growth took place, it was not uncommon to find one tube inoculated from an eye, to contain a pure culture of one organism, the second tube a pure culture of another organism, and so on. Even when a tube showed a mixed growth upon the medium, the number of organisms contained in one loopfull of the conjunctival fluid was comparatively small (varying in number from 2 or 3, up to perhaps 40) and the resulting colonies were generally scattered over the surface in such a manner as to make it an easy matter to obtain pure cultures without having recourse to plate cultures.

In my next series of cases, I discarded the platinum loop in favor of a small swab of absorbent cotton-wool wound around a 6-inch length of iron wire, and the whole inclosed in a test tube—plugged and sterilized in the hot air sterilizer—after the manner usually adopted in preparing swabs in taking specimens from throats of cases of suspected diphtheria. The lower lid of the eye to be examined is depressed, and the fluid from the lower fornix mopped up with a swab, and the entire length of the lower sac wiped with it whilst in the act of withdrawing it. The swab is next introduced into the serum tube, some of the water of condensation taken up by the cotton-wool and it is then smeared well over the sloped surface of the medium. The swab is next used to inoculate a tube of nutrient bouillon. This latter is examined microscopically after twenty-four hours incubation at 37.5° C., and if a growth is found to have taken place, gelatin and agar plates are poured from it, and the organisms isolated.

The exact position from which the conjunctival fluid is taken is a point of some importance. When one everts the lower lid by gentle traction, with the forefinger of one hand, a small quantity of fluid may be noticed in the lower fornix immediately below the caruncle. Into this I dipped my platinum loop or cotton-wool swab, reasoning that the tears, practically sterile when they emerged from the ducts of the lachrymal gland would, after washing over the whole surface of the conjunctiva in the performance of their duty of flushing out the conjunctival sac, collect here with their cargo of bacteria and debris before passing through the punctum on their way to the lachrymal sac; therefore, fluid from this situation would contain a larger proportion of organisms than that taken from any other part of the conjunctival sac. That this inference is a correct one, is proved by the fact that specimens of fluid from the upper fornix are almost invariably sterile, whilst fluid from the same eye, but taken from the spot I have indicated, has given rise to an extremely varied growth.

The next method tried was a modification of that suggested by Morax, the differences being that I substituted normal saline solution—previously sterilized—for the fluid gelatin, and planted on blood serum in addition to pouring gelatin and agar plates.

On comparing these various methods, I find that the sterile swab is the most convenient and reliable, giving rise to a growth as large and varied as any plan I have yet tried; and it is at the same time less trouble and cleaner than any except, perhaps, the platiuum style to which, however, it is immensely superior in taking up a larger quantity of secretion, and in not having to be sterilized in the flame in the presence of the patient—a point of no small importance where children are concerned.

Microscopical examination of cover-glass "smear" preparations made direct from the conjunctival secretion, is, to all intents and purposes, a waste of time—an obvious inference from a consideration of the fact that a tube of nutrient medium, inoculated from the secretion often after incubation, remains sterile or shows but a single colony.

I have made as many as six cover-glass preparations before planting blood serum tubes from the secretion in a normal conjunctival sac. The cover-glass preparations have been stained in various ways, and I have carefully gone over each of them on a mechanical stage with a 2 mm. objective, without being able to observe a single bacterium; whilst, on removing my tubes from the incubator after twenty-four to thirty-six hours, a most luxuriant and varied growth has met my gaze. And this is not a solitary experience.

The following table is not arranged in the order in which the observations were made, but has been compiled by grouping together such cases as appear to have been living under comparable conditions with regard to their environment, and give decided point to my remarks anent the relationship of surroundings to the bacteriological flora of the conjunctival sac.

In the first group are placed a number of subjects, who were my co-workers and assistants in the laboratory, and the observations were made in the laboratory during the day's work; and in no case was the conjunctival sac found to be sterile.

The second group contains cases chosen from the outpatient department of the hospital, and picked out on account of their dirty, or even filthy condition; these characteristics being held to bear a direct relationship to their home surroundings.

The next group was, through the kindness of the medical superintendent, drawn from the wards of a large Poor Law infirmary. These showed a fairly large percentage of sterile conjunctival sacs.

Analysis of Observations.

SERIES	Number of Individuals.	Number of Sacs Examined.	Number of Sacs Sterile.	Percentage Sterile.	Method of Collecting Material.
I.	8	16	nil.	—	Sterile swab of wool-cot'n
II.	29	57	23	40	Sterile swab.
III.	13	25	15	60	Platinum loop.
IV.	26	52	37	70	Various.
Total...	76	150	75		

The last group consisted of persons who were on a higher rung of the social ladder, and whose appearance denoted that the mechanical process of the removal of bacteria from the surface of the skin, by means of soap and water, was frequently practised. These gave a still larger percentage of sterile sacs.

Organisms Isolated From the Normal Conjunctival Sac.

1.	Staphylococcus pyogenes aureus,	observed	16	times.
2.	" " citreus,	"	4	"
3.	" " albus,	"	13	"
4.	" epidermidis albus, (Welch)	"	14	"
5.	" cereus flavus,	"	2	"
6.	Streptococcus pyogenes (longus)	"	3	"
7.	" brevis	"	1	"
8.	Micrococcus candicans,	"	4	"
9.	" tetragenus,	"	2	"
10.	Sarcina aurantiaca,	"	5	"
11.	" lutea,	"	10	"

12.	Bacillus alvei,	observed	1	" times.
13.	Bacterium coli commune,	"	3	"
14.	Bacillus hirn.	"	1	"
15.	" liquefaciens fluorescens,	"	2	"
16.	" fluorescens non-liquefaciens,	"	1	"
17.	" liquidus,	"	6	"
18.	" megaterium,	"	2	"
19.	" messentericus vulgatus,	"	4	"
20.	" prodigiosus,	"	5	"
21.	" pseudo-diphtheria (Hoffmann)		7	"
22.	" xerosis,	"	6	"
23.	" subtillis,	"	8	"
24.	" ubiquitus,	"	3	"
25.	Proteus vulgaris,	"	10	"
26.	" mirabilis,	"	4	"
27.	Torula alba,	"	3	"
28.	Penicillium glaucum,	"	1	"

Pathogenesis.

My experiments under this heading have not, for very obvious reasons, been extended to each and every one of the organisms enumerated above.

I have contented myself with introducing pure cultures of some of them, when isolated from the conjunctival sac, into the subcutaneous tissues or serous cavities of animals that, according to recorded observations, are most susceptible to such bacteria, drawing my conclusions as to their degree of virulence from the results of the inoculation experiments. No attempt was made to determine the action of the various organisms, which have been isolated, upon the rabbit's cornea—experiments which are so pregnant with sources of fallacy as to be practically useless. As a detailed account of all the inoculation experiments carried out in this connection would serve no useful purpose, I will confine myself to such of them as refer to the staphylococci and streptococci.

Staphylococcus Pyogenes Aureus. Of the 16 times that this organism has been isolated, I have thrice tested its pyogenic properties, and in each case with a positive result. The following experiment will serve as a typical one:

One loop-full (0.5 m.g.) of a 24-hour agar culture was emulsified with 1 c.c. of sterile broth, and inoculated into the subcutaneous tissue over the abdomen of a guinea-pig weighing 250 grammes. At the end of 24 hours, a slight amount of local edema was present at the seat of inoculation; this increased, and in three days an abscess had formed, the pus from which gave rise to a pure culture of the staphylococcus aureus. The skin over this abscess sloughed and at the end of eight days the animal died. Post-mortem appearances typical; metastatic abscesses in the kidney and a few cooci in the general circulation.

Staphylococcus Pyogenes Citreus. Two of the specimens of this coccus were inoculated into the living tissue, with the result that one was found to be possessed of considerable virulence, whilst the second had but feeble pyogenic powers.

0.5 m.g. of a 24-hour agar culture was introduced into the subcutaneous tissue at the root of a mouse's tail, by means of a small spatula. Three days later it was noticed that the mouse was unable to use its left hind leg. At the time death occurred, (eight days after inoculation) a' large subcutaneous abscess, occupying the whole of the hind quarters, was present. Post-mortem the abscess cavity was found to communicate with the left hip joint; the staphylococcus citreus was recovered from the spleen.

II. The whole of a 24-hour agar culture of the staphylococcus citreus was emulsified with a 2 c.c. of sterile broth, and 1 c.c. of the mixture inoculated into the subcutaneous tissue of a guinea-pig's abdomen. After three days a small circumscribed abscess had made its appearance: the pus from it gave rise to a pure culture of the "citreus." The animal recovered.

Staphylococcus Pyogenes Albus. This coccus was isolated 13 times and was examined with special reference to its pathogenicity four times. Large quantities of early cultures were used to inoculate mice—the peritoneal cavity being the situation chosen for the reception of the microorganisms. These experiments resulted in death in two instances. In the remaining cases the organism appeared to have lost its pyogenic properties.

Streptococcus Pyogenes or, preferably, the streptococcus pyogenes longus, was, when isolated from each of the cases in which it was found, planted in broth, and 1 c.c. of the 24 hours growth inoculated into the subcutaneous tissue at the root of a mouse's tail. Two mice inoculated in this manner died in three days, the third after five days. The post-mortem appearances were those of typical streptococci infection.

Streptococcus brevis proved to be, as was anticipated, non-pathogenic.

Whilst it is true that the foregoing remarks, which demonstrate fairly enough the variety and frequent pathogenicity of the bacteriological flora of the normal conjunctival sac, are to a large extent counter-balanced by the relatively large percentage of sterile sacs, still the question which naturally arises is: How is it that so few operations on the eye go wrong?

A consideration of the point to which I have already drawn attention, viz., that the upper fornix is nearly always sterile, whilst the lower one so frequently contains organisms, suggests as an explanation, that the conjunctival surface of the eye is kept in its comparatively sterile condition, by means of the constant flushing of the lachrymal secretion—a purely mechanical process in itself, but probably aided in part by the bactericidal action which this fluid shares in common with other similar secretions of the human body.

That the bactericidal action of the tears is a very real one is, I think, evidenced by the alteration which is found to have taken place in the biological characters of organisms obtained from the conjuctival sac, quite apart from the results published by Bach, Stort, Bernheim and Ahlström. I am, I think, correct in saying that all observers who have worked at the bacteriology of the conjunctival sac have been confronted at the outset by the difficulty experienced in obtaining a growth from this situation—even when bacteria are known to be present. In addition, the rate of growth is appreciably decreased; organisms which when isolated from other situations show a good naked-eye growth on artificial media at the end of 24 hours, require, when obtained from the conjunctival sac, 36, 48 or even 60 hours in the incubating oven, to present an equal growth.

Many organisms, notably the xerosis bacillus, as I have shown elsewhere, will refuse to grow, except upon inspissated blood serum, when planted direct from the conjunctival secretion. Repeated sub-cultivation upon this medium through a number of generations will, however, restore the lost saprophytic chatacters, and the bacillus can then be grown on the ordinary media.

I have frequently inoculated from the same eye, and under precisely similar conditions, tubes of culture media, in the following order:

1. Inspissated blood serum (slanted).
2. Nutrient Agar-agar.
3. Nutrient gelatin.
4. Inspissated blood serum.
5. Nutrient agar-agar.
6. Inspissated blood serum.

After incubating, I have obtained a growth upon 1, 4 and 6, tubes 2, 3 and 5 remaining sterile.

Now, the majority of corneal sections are made in the upper half of the cornea, and are consequently subjected to this flushing process during the whole course of repair. With such an incessant system of irrigation going on it is clear that unless some condition obtains which so lowers the vitality and resisting powers of the cells composing the conjunctiva, as to afford a foothold for bacteria, no given organism could remain in the conjunctival sac for any lengthy period.

The following experiment, which was repeated many times with precisely similar results, has a direct bearing upon this point:

0.1 c.c. of an 18-hour culture of the B. prodigiosus was introduced into the healthy conjunctival sac of a full grown rabbit. (Plate cultivations gave 4096000 as the approximate number of organisms to the cubic centimeter.)

At varying intervals 0.05 c.c. of fluid was removed from the conjunctival sac, by means of a sterile capillary pipette, and agar plates poured. These plates were incubated for 48 hours at 20° C. (this temperature being chosen in order that the colonies might be faintly colored and so easier to count.) The resulting numbers may be tabulated as follows:

At 0	hours	0.05 c.c.	contained	20400	colonies	of the	B. Prodigiosus.
¼	"	"	"	1992	"	"	"
½	"	"	"	704	"	"	"
¾	"	"	"	596	"	"	"
1	"	"	"	250	"	"	"
1½	"	"	"	12	"	"	"
3	"	"	"	3	"	"	"
24	"	"	"	nil.	"	"	"

In conclusion, the thesis may be summarized as follows:

1. The conjunctival sac frequently contains microorganisms, extremely varied in character, and which may or may not be pathogenic.

2. The conjunctival sac of any given individual may be sterile at the particular moment an observation is made. When considered as divisible into two portions, an upper and a lower fornix, the former is much more frequently sterile than the latter.

3. The sterility of the conjunctival sac is due to the mechanical flushing of its mucous surface by the lachrymal secretion—aided, perhaps, to some slight extent by the bactericidal action of that fluid.

The question of the attempted production of a sterile condition of the conjunctival sac, by artificial means, though extremely interesting and worthy of discussion, is obviously beyond the scope of the present paper.

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SECONDARY GLAUCOMA.*

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It is probable that under the title of this paper might be quite correctly classified all cases of inflammatory glaucoma, whether acute or chronic. There would then remain a comparatively small, illy defined group of cases of a non-inflammatory type, to be designated as simple or primary. Increasing clinical experience has surely taught that the increased tension of the eyeball, the insensitive and steamy cornea, the impairment of peripheral and central vision, is a group of symptoms frequently occurring as a resultant of widely diverse pathclogicol processes. For example, we find this important and interesting symptom-group as a sequel to hemorrhagic retinitis, or to chronic but steadily advancing disease of the uvea in gouty subjects. We meet it again in cases of dislocated lens, or following large rents in the lens capsule, caused either by discission operations or by accidental traumatisms, which cause a rapid swelling of its substance and speedy loading of the aqueous with the dissolved cortex. It not infrequently presents itself as a part of the closing scene in the destructive processes which characterize plastic irido-cyclitis, fiercely attacking, as they do, the anterior segment of the globe, or in uveitis, which involves usually the entire uveal tract. In all of these widely differing conditions the glaucoma group of symptoms occurs as a sequel, probably never as a primary or initial condition.

I do not propose to discuss these suggestions in all their bearings, but simply to give briefly the history of two cases which illustrate widely diverse types of disease, each leading up finally to the symptom-group we call *glaucoma.*

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CASE I. Plastic irido-cyclitis-annular synechia, and occlusion of pupils. Secondary glaucoma. Iridectomy. Recovery, with moderate vision.

W. W., colored man aged 32, came to the Wills' Eye Hospital, June, 1894. He had suffered from an attack of iritis, probably syphilitic, in 1884, since which time he had had frequent attacks of pain and redness of the eyes, for which he had received no treatment. His vision had gradually failed until he found it difficult to do his work, that of a farmer. During these years he had suffered from frequent attacks of headache, which had lately become constant, and his vision was often so poor that he could with difficulty find his way about in strange places.

O. D. V. large letters at 1 m., but was often much worse.

O. S. V. q. p. l.

The following conditions were noted: O. D. Pupil small, annular synechia, anterior capsule gray, anterior chamber shallow, and angle closed by adherent iris. Tension + 1. Slight ciliary injection, no study of fundus possible, contracted field of vision. O. S. same general conditions present, but pupil was in addition occluded by a mass of exudate. The iris was pressed forward and was lying apparently in contact with the cornea, the pupil lying in the apex of a funnel-like depression. The ball was soft. He was placed on mercurial inunctions and eserin. Potas. iod. in ascending doses internally. This treatment was maintained until the latter part of September. During this time, although his health improved, he suffered severely from headache, and had repeated attacks of increased tension in both eyes. His vision grew rapidly worse, so that he was led to the clinic by his wife, and the candle fields were contracted to a few degrees. He was then admitted to the hospital, and a broad iridectomy made upward in both eyes. It was impossible to carry the point of the keratome between the cornea and iris. It was, therefore, entered well back and penetrated the posterior chamber, being brought forward through the iris into the anterior chamber near the pupillary border, care being exercised to avoid the lens. A quantity of viscid yellowish fluid exuded from the wound. The iris forceps were introduced, and seizing the iris at the cut portion near the pupil was gently drawn out of the wound in the reverse order from that ordinarily employed. It was found sufficiently tough to bear traction in the right eye, but very friable in the left so that it was taken away in fragments, but a large coloboma was secured in each, which fortunately remained open. The eyes healed promptly, but continued red and irritable for many weeks. The anterior chambers resumed their normal depth, and both balls became soft. The headache promptly disappeared, and he was soon able to see his way about the ward.

After six weeks he was discharged from the hospital with sufficient vision to be able to go home without a guide, and became an out-patient. Potas. iod. and bichloride of mercury, alternating with iod. of iron, were continued with more or less regularity for a year or more, with local washes, atropin and weak solutions of eserin.

He has never had any recurrence of headache, or pain or redness of his eyes, and the tension of the balls has steadily improved. He attends the clinic without a guide, and is able to resume his work about the farm.

Case II. Uveitis—secondary glaucoma.

September 9th, 1894, R. W., a mulatto, presented himself at the Wills' Eye Hospital for treatment. He complained of dull headache and photophobia. He related that the *left* eye became red and painful during the summer of 1894, and had been under the care of his physician for a long time before he observed failing vision in the right. He denied syphilitic infection at any time, but was evidently in ill health and of a so-called strumous diathesis.

The pupils were dilated with atropin prescribed by his physician.

The following objective conditions were noted: In *O. D.* there was some ciliary injection, the epithelial surface of the cornea was normal, but the posterior surface was dotted with numerous gray points which were arranged in a more or less triangular form in the lower part of the membrane of Descemet. The anterior chamber had normal depth, but the aqueous humor was slightly turbid. Viewed through this, and the deposit on the cornea, the iris seemed to lack luster and presented an apparently smooth uniform surface. The pupil was dilated large medium, and no synechia were present. Only a veiled view of the fundus could be obtained. There were floating vitreous webs, and the nerve borders were lost in the surrounding infiltration of the fundus. T. = n., V. = $^6/_{12}$. Field for form normal.

In O. S. there was more pronounced ciliary injection. The cornea was found steamy throughout, and at its lower part a large crescentic area extending from the limbus to a point near the horizontal meridian of the cornea, exhibited deep gray infiltration, over which the cornea appeared flattened, but the epithelium was intact.

The anterior chamber had apparently normal depth. The pupil was small and its margins partially adherent to the anterior capsule, which was gray. V. = $^6/_{30}$ slight minus tension. No satisfactory study of the eye ground could be made.

He received potas. iod. and corros. sub. with tonics internally, and atropia locally. By November 11th the eyes had lost their injection and dread of light, and his headache was better, but vision in O. D. had fallen to $^6/_{15}$ and small, slender synechia had formed, and the vitreous degeneration had also advanced. In O. S. V. $^6/_{48}$. Tension and fields were normal in each eye. The atropia was stopped. On November 23d the cornea was steamy, vision had fallen to $^6/_{60}$ in each, and severe pain in the eyes came on daily—after noon—for which he received eserin locally and anti-periodic doses of quinine. There were transient attacks of increase of tension, but these would disappear after massage and instillation of eserin, even while waiting in the clinic room. The eserin alone, however, was not well borne, the eye often doing better under atropin, or the two drugs used alternately. He would have intervals, often extending over many days, of freedom from pain, during which the haze of the cornea would be absent and the vision would improve, then suddenly and without known provocation the symptoms would return with marked increase of tension, which could always be speedily relieved by manipulation and eserin. The case progressed until Febrvary 11th, 1895, when under an unusually severe exacerbation of acute glaucoma vision fell to the ability to count fingers with difficulty—cornea steamy and insensitive T. +1. Severe pain, anterior chambers normal depth.

He was admitted to the hospital, placed on mercurial inunction, eserin and light massage. Under this treatment, with extra diet and tonics, the glaucoma rapidly disappeared and vision once more came up, but there was a marked cut in the lower temporal fields of both eyes.

On March 6th the eyes were nearly white again, and although there were transient attacks of increased tension the eyes were free from pain. On March 12, 1895, the fields were found as shown in Fig. 2, a and b. O. D. V. = fingers only. O. S. V. = $^5/_{60}$. A broad iridectomy was then made in the right eye. The recovery was rapid and without reaction, and in four weeks V. $^4/_{60}$. On April 1st an iridectomy was made on the left eye, which also recovered without reaction, and the man was discharged from the hospital on April 15th, 1895, with both eyes white, the fields of vision nearly normal. T. — 1: O. D. V. = $^4/_{60}$. O. S. V. $^5/_{60}$. No satisfactory studay of fundu possible: cornea clear, except lower quadrant in left eye. There was no return at any time of increased tension, but there were repeated attacks of bullous keratitis in both eyes during the following summer and autumn. The eyes, however, finally became quiet. A year later, March, 1896, V. had fallen to $^1/_{60}$ in O. D. from commencing opacity of the lens. O. S. had risen to $^6/_{48}$. In April the right ball was soft, lens opaque, q. p. l. shallow anterior chamber. O. S., V. = $^6/_{48}$ and white, T. — 1, in each eye.

The history of these patients is presented as illustrative of two essentially different groups of patients, both unfortunately very common, but in the opinion of the writer of great interest because they shed much light upon the etiology of increased tension. In both cases was witnessed the steady progress of disease culminating in all the signs of inflammatory glaucoma—increased tension, steamy and insensitive corneæ and contracted field of vision, all the symptoms being promptly relieved by iridectomy. Nevertheless, they present few if any other features in common. In Case I. was present all the conditions of a plastic irido-cyclitis, viz., an acute iritis, followed by frequent recurrences of milder or acute exacerbations, leading to annular synechia, occlusion of the pupils, infiltration of the iris and ciliary body with the products of inflammation, copious exudate imprisoned behind the iris, which was pressed forward by its accumulation effectually blocking the spaces of Fontana and thus closing the excretory channels at the angles of the anterior chamber.

In Case II. we have presented a history which differs from Case I. in all essential particulars. The marked tendency to a plastic exudate is absent. Only a few thread-like synechiæ were formed. The onset of the disease was insidious and steadily progressive, attacking first the left eye, and after many weeks spreading to the right, where the first manifestation was that of dimness of vision, which proved to be due to an infiltration of the retina and choroid at the posterior pole, which blurred the optic nerve margins and veiled the details of the fundus; then degeneration of the vitreous body, shown first by a sand-like deposit, and later by webs which, as the disease advanced, became more dense and floated more and more freely, while the acuity of vision rapidly declined. Then came deposits on the posterior surface of the cornea from the aqueous, which became more turbid from the increasing exudate. Not until this stage of the disease was reached was there observed any tendency to increase of tension. At no stage of the affection was the anterior chamber shallow or the angle closed by the periphery of the iris; at no time was there any arrest of communication between the posterior chamber and the spaces of Fontana. Nevertheless, as in Case I., we observed, late in the disease, the increased tension, the steamy and insensitive corneæ, the contracted fields of vision, also relieved by iridectomy never to return.

It is obvious that from the start to finish we have two essentially different types of disease portrayed in the history of these two patients, both, nevertheless, culminating in a common group of symptoms depending upon a mechanical condition which required for its relief the same mechanical interference. Many important and interesting inquiries present themselves for discussion, especially in Case II. First, in both interest and importance, is the nature of the disease in the right eye. Was it idiopathic, or was it secondary to that in the left eye, which was first involved, and probably due, primarily, to an abscess in the lower part of the cornea?

In the second eye the disease certainly manifested itself first in and around the papilla, and subsequently spread forward gradually manifesting all the conditions ordinarily present in so-called sympathetic ophthalmia of the serous type.

In Case I. the increase of tension was obviously due to the exudates and fluids imprisoned behind the iris and by the closure of the angle of the anterior chamber. In Case II. it is probable that the anterior excretory channels were clogged by the profuse albuminous exudate. This view seems to find corroboration in the relief which was frequently afforded by massage.

A CASE OF RIGHT-SIDED LATERAL CONJUGATE PALSY.

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We are all familiar with the conjugate deviation of the eyes which occurs in association with various lesions of the brain, and also recognize the importance which it bears in a diagnosis of the location of the lesion, irritative or destructive, as it may be. In irritative cerebral lesions the eyes are turned away from the side of the lesion toward the convulsed side. while in a destructive cerebral lesion the eyes are turned toward the lesion away from the paralyzed side. If, however, the lesions be in the pons, the result is just the opposite, the eyes are turned toward the irritative lesion, or away from the convulsed side, and in a destructive lesion toward the palsied side, or away from the lesion.

Of more interest, because not so frequent, are the cases of simple conjugate palsy, by which we mean that the eyes are so affected that neither one can turn toward a certain side; for example, the external rectus of the right eye and the internal rectus of the left eye are affected so that neither eye can be turned to the right side. Such a case suggests the question of the mechanism of conjugate palsy and the location of the center for conjugate movements, if such a center exists. Gower thinks there is such a special center and places it in the olivary body, while other authorities incline to the view that the sixth nerve nucleus is also the center for conjugate lateral movements. Practically certain are we that the sixth nerve nucleus is joined to the third by fibers which, in part, compose the posterior longitudinal fasciculus so that the pathway for conjugate movement might be traced thus —the impulse travels from the cortex to the sixth nerve nucleus, thence part of it travels out the sixth nerve to the external rectus, while another part by the posterior longitudinal fasciculus crosses to the third nerve nucleus on the opposite side, whence it passes to the internal rectus of the other eye. Some such connection seems to be required, but there is considerable truth, no doubt, in the statement of the writer in the *American System of Ophthalmology* (p. 403) when he says that "a study of the literature of the subject seems to suggest that neurologists have been occupied in designing a mechanism capable of doing the work which may be required of the mid-brain rather than unraveling the structure of this region as it is found to exist," Bleuber's theory, which Jeffries thought the best, is that the fibers run direct from the cortex to their respective root nuclei, and that there are two sets of fibers for the internal rectus muscle, one for conjugate movement, the other for convergence in near vision.

In most of these cases of conjugate palsy the internal rectus cannot act at all, but sometimes it will act in convergence, though not in conjugate movements. Jeffries, in his paper on ocular paralysis, makes one group of this type. He saw ten such cases, and autopsies in eight showed the lesion just below or at the eminentia teres. It was small in most cases, and did not affect much tissue in this region. Mills reports a similar case, with the lesion just below the eminentia teres and in the upper quarter of the pons. The following case is a typical example of this form of palsy:

L. K., age 10 years, was brought to see me August 20th, 1896. Her mother died of carcinoma of the uterus, when the child was 6 weeks old. The father is living and healthy, but is frequently troubled with boils. The little girl was likewise troubled when she was very small. She has one sister, now 14 years of age, who is perfectly healthy. This little girl has never been strong. She had convulsions when she was 5 months old, has been troubled all her life with her tonsils, and also somewhat with bronchitis. When 5 years of age she had a very severe attack of tonsillitis. In December, 1894, she had scarlet fever and in March, 1895, before she had fully-recovered from this, she developed measles, and while she was convalescing from this, rheumatism set in. The joints of the feet and hands were reddened, swollen and painful. The eye trouble is said to have begun at that time. Diplopia was noticed, which the little girl thinks was most marked when she looked to the left. Convulsions developed shortly after this. These were bilateral. The arms and legs were drawn up, and if straightened would not remain so. The mouth could not be opened. The patient became purple in the face and completely unconscious. As she improved in this respect she had fainting attacks. She would complain that she could not see, and then fall. She was apparently unconscious for a moment. Had never bitten the tongue at such times. The last time she fainted was May 30th. Last summer, even, she would fall occasionally, complaining first of a veil before her eyes so that she could not see. Though she never falls now, yet she does trip very easlly, and when she becomes nervous she tends to drag her left foot. The diplopia continued about four weeks. The child has a bad temper, and is very irritable since her illness. She gets along very well at school, and has no headaches, little or no difficulty in using the eyes, and is never troubled with nausea nor vomiting, except very occasionally when she is bilious. Examination of the heart showed the apex in normal position; sounds normal; pulse is 88; lungs are normal; spinal column shows no curvature, and is not tender to percussion; there are no sensory disturbances of any kind; grip in the two hands is equal, as is also the power in the two legs. Knee jerk is decidedly increased on each side, and very slight tendency to ankle clonus exists. Urine is acid, has specific gravity of 1010 and contains neither albumin nor sugar.

Examination of the eyes reveals vision $^6/_6$ partly in each eye. Accommodation: Jaeger No. 1, pp. 7 cm. in each. Ophthalmometer indicates no astigmatism in either eye. Ophthalmoscopic examination shows in O. D. media clear, disc round, slight haziness of the edges of the disc, choroid very granular in the periphery, slight choroidal changes in the lower portion of the fundus, better condition in the macular region, venous pulse, blood vessels normal in size and distribution, slight striation of the retina. H. about 1 D. O. S. similar condition, except a crescent of choroidal pigment at the inner edge of disc and a smaller crescent out. The pupils are equal and respond to light and in accommodation. The most interesting condition, of course, is that of the eye muscles. The eyes move perfectly well to the right, but not beyond the median line toward the left, either alone or together. In convergence, however, the right internal rectus acts perfectly well, as is shown by the fact that there is practically no divergence under cover; in fact, with a vertical prism before one eye, there is an exophoria of only 3° in convergence. At a distance with the Maddox rod there is an esophoria of 2° and no hyperphoria. With a red glass no diplopia can be produced in any part of the field, and horizontal lines as seen by the two eyes with a vertical prism before one are perfectly parallel.

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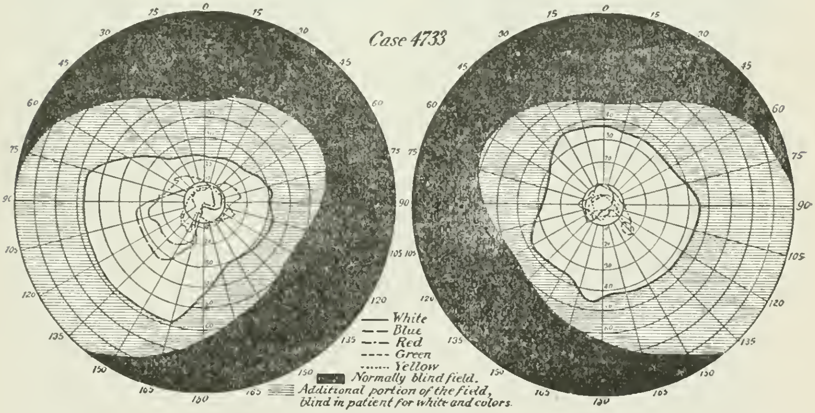
RETINITIS PIGMENTOSA WITHOUT THE CHARACTERISTIC PIGMENTATION.—A REPORT OF TWO CASES.

By George M. Gould, A. M., M. D.

PHILADELPHIA, PA.

(Illustrated.)

So far as I have been able to learn, only five cases probably like those I shall describe, have been reported, and the reports of these contain no charts of the visual fields for colors, while two are without the fields for white, as well as without other important details. My cases are as follows:



Case 4733.—A young lady of 26, a typewriter (and a very expert one) by profession, presented herself on May 1, 1897, complaining of headaches and obscure ocular and cerebral symptoms, apparently due to eye strain. Under mydriasis I found her error of refraction to be:

$$R. - Sph.\ 0.37 - Cyl.\ 0.24\ ax.\ 180 = {}^{20}/_{20}.$$
$$L. - Cyl.\ 0.37\ ax.\ 180 = {}^{20}/_{30}.$$

There was no considerable muscle-imbalance.

The ophthalmoscopic examination was negative, *i. e.*, there was no pathologic tissue-change detected in the fundus. I did not suspect anything wrong and therefore did not make inquiries as to symptoms which were, at a later date, elicited by questioning. I prescribed spectacles for near-work.

I am sorry that lack of space compels the insertion of illustrations too small to bring out clearly the distinctions between the different fields.

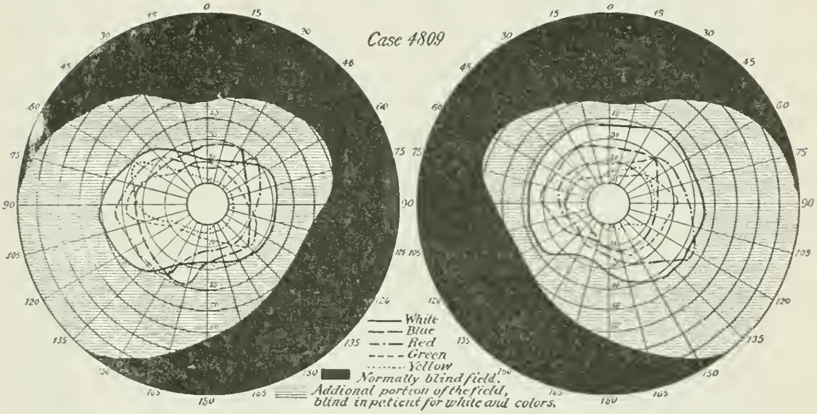
At a subsequent visit, in conducting the patient out of the office, I noticed a certain doubtfulness of stepping in the darker hallway, a sort of groping motion of the hands and feet that, had I been more busy, or tired, less alert-minded, might have escaped my attention. Inquiry at once brought out the fact that for three years she had had difficulty in walking at night, and by further questioning, her brothers and sisters confirmed the statement. They had frequently noticed her indecision and stumbling. By tests, I found what I think is a significant sign or hint of the limitation of the visual field: the necessity of bowing the head well downward in darkened halls or at night, in walking over rough places, or in beginning the ascent or descent of unfamiliar stairs. This device is required to bring the images from the periphery to the more central portions of the retina. I show herewith carefully made perimetric charts, enlarged by my friend, Dr. Pyle, of the girl's visual fields, setting forth the extreme peripheries of the same for white, red, blue, green and yellow. These charts tell the story perfectly. The white fields are about half the normal extent, those for the remaining colors are very small, extremely irregular in outline and in relative order.

With aroused attention I now most carefully examined the ophthalmoscopic details of the periphery of the retina. They were such as to have been passed over in routine work, but with not a little difficulty I could now detect numberless obscure tiny dots, brownish or blackish, similar to those of a stippled engraving, closely strewn about the perphery: sometimes they seemingly tended to a streamer-like or strand-like arrangement, but not in the faintest degree suggestive of the appearance of typical retinitis pigmentosa: in no part of the fundus were there any pigment-heapings whatever, and all the vessels were without the least abnormal pigmentation. This punctate appearance, or microscopic stippling, was confined to the extreme periphery, ceasing gradually as one approached the equator.

The patient was not color-blind, although across the blind indentations of some of the color fields certain tints were not detectible until the traveler overlapped the white fixation-spot. Even if there had been central color blindness for these colors, I do not think the patient, with both eyes open, would have failed to distinguish the tints accurately enough, either because of one field supplementing the other, or by the unconscious device of indirect fixation, so that the image would fall on some retinal tissue still normally responsive to the stimulus. It is interesting to note that in approaching the center of fixation, the red and blue travelers were for 5° or 10° perceived as pink, or spotted, before the true tint was detected. Other parachromatisms were found in charting the fields. Of especial interest is the fact of the little island of preserved blue-response in the southeast portion of the right field, separated from the central field by 10° or 15° of space insensitive to the color. Into this island a sharp angle of peninsular red extends.

The discovery of the true nature of the foregoing case, of course, moved me to secure examinations of this patient's relations, and I was able to do so in the cases of two brothers, one sister, and their mother. In one brother, and in the mother, inquiry, refraction, and ophthalmoscopic examination were negative, except that in the sister, there was an almost indistinguishable stippling of the retinal periphery, similar to that in her sister, but less distinct. The perimeter, however, showed normal fields. The pathologic process was either incipient, or had been checked prior to any involvement of the distinctive retinal function—and this was at least a suggestive fact to be borne in mind in the future. In one brother, however, I had the scientific delight of finding another case like that of the affected sister—a typical case of what, lacking a better name, we must at present paradoxically call retinitis pigmentosa, without the characteristic pigment.

CASE 4809.—This patient, a brother of the patient whose case I have just described, is a strong, healthy business man, 29 years old, who, with the exception of night blindness, had never suspected anything abnormal as regards his eyes or vision, besides his ametropic error, measuring


Case 4809
White
Blue
Red
Green
Yellow
Normally blind field.
Addional portion of the field, blind in patient for white and colors.

R. — Sph. 0.25 — Cyl. 1.25 ax. 180° = 20/30.
L. — “ 0.75 — ” 1.50 ” 180° = 20/30?

He had, however, to bow his head to see the ground or floor at night, and his brothers and sisters, as well as himself, had been aware that for ten years he stumbled, or was abnormally undecided and bothered in walking at night or in dimly lighted rooms. Even with perfect correcting lenses, it is noticed that his 20-foot amblyopia is greater than the sister, although his visual fields are far less abnormal and limited. He had the same stippling as the sister, at the periphery of the retina, but like her, there was not a pigment-cluster or line so large as the smallest pinhead in the entire fundus. As in the sister's case the vessels, disc, etc., were not abnormal. Both being blondes, the choroidal vessels were somewhat clearly visible. I show you the fields for white and the four principal colors, from which you will see their precise delimitations.

Your own scientific and dramatic satisfaction can hardly equal that of mine in learning that, although the father of these children was free from the symptoms of the disease in question, *his* father, that is, the paternal grandfather of the two patients, had all his life, decided and complete night blindness, and went entirely blind, not probably from cataract, at the age of 70. When I asked the mother concerning the symptoms, she remembers that her husband's father had to bow his head very low, when in doubt, to see the ground, stairs, etc. I am most sorry to add, that this man is now dead, and that no oculist ever examined his eyes. Whether his disease was with or without the characteristic pigmentation, must remain a regretable mystery. Under the circumstances, there cannot be the slightest doubt that it was one or the other. The knowledge would help to determine two important questions, that relating to heredity, and that as to the essential identity of the disease.

I regret very much that it was impossible for me to measure the variation of central and peripheral acuteness under diminished illumination. Being private patients, their good will was exhausted by the perimetric examinations, and I judged that these tests were of far more importance than those pertaining to the intensity of the retinal stimulation. There can be no doubt that, as in all such conditions, the law of greater contraction of the fields, and lessened acuity would have followed the lowering of the illumination. In this connection, of the most suggestive interest is the case of Atwood (Royal Lond. Oph. Hos. Rep., 1895), in which with normal fields for full illumination, there was contraction under lowered illumination. I suspect, however, that perfectly normal and healthy eyes might exhibit this phenomenon more or less. It would seem to be a logical deduction from the known laws of light and sensation. If this is true, the initial stages of retinitis pigmentosa without pigmentation might naturally exhibit a disproportionately greater reduction, both in acuity and contraction.

A Brief Review of the Literature.*

Nothing better illustrates the importance of a proper definition and use of words, than that pertaining to the words hemeralopia and nyctalopia. For years I have been advising their utter disuse on account of the confusion sure to result if each writer does not distinctly state what he means whenever he employs them. But until I attempted to collate the literature on this subject, I never suspected the extent of misfortune connected with the term "hemeralopia." In the first place, and in any case, it denotes but a symptom, and may be a consequence of very diverse and manifold causes and conditions. The same author will sometimes use it in the most contradictory senses, or one author will use it to denote one symptom or disease, while another will understand the reverse. Nobody defines the word, and yet by the reports of cases one finds it to mean amblyopia, night-blindness, day-blindness, photophobia, and a multitude of other symptoms. One finds that it may be caused by exposure to bright light, electric light, snow, etc., or may be due to myopia, or to any form of local ocular disease; it may be the result of deprivation of food, or the consequence of a hundred systemic diseases; it may be transient and curable, functional or organic, chronic or congenital; it may be anything or nothing. Great is hemeralopia of the Germans! I have never yet found anyone who could define the word, and I am quite sure it is beyond the power of the finite mind. Let it be anathematized, world without end!

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*I am under obligations to my friends, Dr. Wendell Reber and Dr. W. L. Pyle, of Philadelphia, for valuable and kind assistance in collecting the reports reviewed.

In endeavoring to digest the literature, I have been forced to exclude several classes of cases as not like those I report. These cases are as follows:

1. All such as were acute or functional, whatever may have been the cause. The disease of my patients was chronic and perhaps congenital. With such cases those have no analogy which were plainly due to a temporary cause, and that recovered under treatment and rest.

2. Diseases due to light-traumatism, such as from over-exposure or over-stimulation by bright light, snow, etc.

3. Diseases certainly or possibly due to such local ocular affections, as malignant myopia, optic-nerve disease, choroiditis, retinitis, xerosis of the conjunctiva, keratitis, etc., or to reflex ocular neuroses.

4. Affections the result of systemic diseases, as e.g., anemia, drug-intoxication, fevers, digestive malfunction, deprivation of food, etc.

5. Cases in which the reports were self-contradictory as, for example, those of hereditary congenital night-blindness, in which the visual fields were reported "normal," or in which the patient saw better by night than by day. They surely had no pathology at all like that of my cases.

I have also been forced to put aside cases reported as "hemeralopia," but the reports of which, with all the intellect and sympathy I was able to command, were utterly unintelligible to me. It is possible that among these there may have been some belonging to the same class as my own. But were it so, it must be added, that the omission from the reports of the all-important light-fields and color-fields, with other details, must make any use of or deductions from them quite impossible. I may also add, that many writers seemed at first to offer tempting riches, but when I found that the "hemeralope" saw better by night than in the day, that he had central scotomata, that there was no limitation of the fields, or, *mirabile dictu!* that no ophthalmoscopic examination was made, plainly nothing more was to be done.

Most of the text books have none, or only a passing allusion to the subject. There is no reference to it in Gowers, Michel, McNamara, Roosa, Carter and Frost, Hartridge, Wolf, Jones, Juler or Stellwag. The first case in point of time that I have been able to find of this disease upon which one may rely, is that of Perrin (*Annal d'oc.*, 1875, p. 234—published also in Hocquard's These.) The patient was a soldier of 21, who is described as afflicted with congenital "hemeralopia." This instance was plainly not so pure a case as mine, as there was "a single oval point of pigment along a vein" in the upper part of the fundus of the right eye, and in the left eye "two or three small grains of isolated pigment, stellate in shape.' There was said to be great limitation of the field (for white), but no exact perimetric examinations were made, a fact especially regretable as to colors. "Integrity of the color-sense" is reported. There is also no evidence that the (difficult) examination of the periphery of the retina was carried out with the ophthalmoscope and the results carefully set down. The man died soon after of scarlet fever, and the great value of the otherwise faulty report consists in the very valuable histologic post mortem examination of the retinæ.

The next case reported is that of Huidiez; his article is entitled *Retinite Pigmentaire sans pigment visible a l'ophtalmoscope*, (*Ann. d'oc.*, 1877, p. 211). The patient was a girl child of 8, afflicted with night-blindness from earliest infancy. The author says central vision was good, the fields for white narrowed, and also for colors. No pigment existed along the vessels, but there were traces of slight pigmentary infiltration at the periphery. Here again no charts of the fields, even for white, are given.

Alvarado, in an article entitled *Un Caso de Retinitis pigmentaria sin pigmentation de la Retina visible con el ophtalmoscopia*, (*Rev. de Cien. Med.*, 1882, VIII, p. 269,)

had a patient who was a healthy laboring man of 32, with gradual unaccountable loss of vision. " With strong biconcave lenses, he could read letters No. XL. of de Wecker's scale at 3½ meters." With one eye fixed on some small object on the wall, he could not see small bits of colored paper passed before his eyes in different directions, except at a very few centimeters from the fixed point. If these were placed in front of the eyes, they were distinguished though with some difficulty, this being less so *(mas sensible)* when he tried to distinguish light and dark shades. With oblique vision, at the posterior pole of the crystalline, was seen a star-shaped opacity, of 7 branches in the left eye, and 6 in the right. Proceeding to ophthalmoscopic examination, I was astonished to find the fundus completely clear and limpid, without the slightest trace of obscurity at any point of the retina. Thinking I had made an error in diagnosis, I re-examined the patient, who only confirmed the previous history; with the ophthalmoscope nothing was found beyond a fundus of intense orange color, the pupil standing out perfectly white with well defined borders, the vessels standing out clearly, the retinal vessels, especially the arteries, being quite atrophied. This last did not indicate anything, since the patient could see, and although the clear outline of the venæ vorticosæ might indicate alterations of the epithelium of the choroid, yet this last not being rare in perfectly normal eyes, I could only arrive at the diagnosis of pigmentary retinitis, minus one of its principal symptoms—pigmentation of the retina visible with the ophthalmoscope. With the exception of this last, no other characteristic symptoms were lacking."

The entire report arouses many doubts and questions. The crude tests of the field, without the perimeter, make us pause, the existence of cataract complicates, and yet, notwithstanding this, "the fundus completely clear and limpid without the slightest trace of obscurity at any point of the retina," seems an impossibility, and makes us doubt any accuracy in the report; the failure to say a word about night-blindness makes the last sentence quoted very indefinite, to say the least; the high myopia and rough indefinite diagnosis of the same, complicates our doubt and heightens our skepticism: and, finally, the "fundus of intense orange color" makes us wonder if there was not systemic leucocythemia present. On the whole, I think we must exclude the report, as being of any value, in future statistics and investigations.

In one of Darier's cases (*Archiv. d'oph.*, 1887, Vol. 7, p. 170,) of anomalous retinitis pigmentosa, there were but few typical pigmentary stars, and another had only two or three small black points along the vessels, and peculiar macular changes. One other of his cases, that of a boy of 18, may have been like mine, but the lack of the all-necessary fields and other details, as well as the general indefiniteness of the report, together with certain retinal and macular changes suggestive of a different disease, make me feel very doubtful about it. It cannot be too strongly urged that, especially in these incipient cases, if they may so be called, there need not be, and if uncomplicated, there shonld not be any great retinal, macular, vascular, or disc-changes. The visual field. Darier says, was reduced to central vision. In returning from school in winter, the patient had great difficulty in walking. The reports lead one to infer that the author does not use a mydriatic, and so there is a doubt left in our minds, although he says that in no part of the periphery were there any pigmentary spots. It seems from the pathology of the disease, that were the field limited, there must necessarily be the ophthalmoscopic showing of stippling or of some form of pigment infiltration. As to this case, not a word is said about night-blindness, though we may suppose it to have been present. However, when we find another observer reporting a case purporting to be retinitis pigmentosa without pigment, and yet in which the patient saw better by night, our skepticism is likely to become dominant. I have grave doubts if Darier's case belongs to the class under discussion.

Morton (*Transac. Oph. Soc.* U. K., 1893, p. 147,) has reported two cases, evidently like those I have described. Many male members of the family of these two patients were night-blind for several generations. No abnormal pigmentations of the fundi was found. The fields were much contracted and irregularly so for white, but I am sorry the color-fields are not reported.

Nettleship, *Transac. Oph. Soc.*, U. K., Vol. VII, 1887, p. 301.) reports four cases of permanent partial night–blindness, with unusual ophthalmoscopic changes. These changes were of two types: 1. Minute, discrete, opaque white dots, apparently deposits on the choroid and retina, separated by comparatively wide spaces of healthy choroid. The spots were round or oblong, not glistening, the majority free from pigment, though with some black bordering. 2. Irregular distribution of pigmented epithelium of a mottled or stippled appearance, but not of the reticulated patterns of retinitis pigmentosa Twilight blindness had always existed in all. It is to be noticed that in one of the four cases there was no contraction of the field, and no mention is made of contraction in the other three cases.

Galezowski (*Recherches Ophtalmoscopiques*, 1863,) described a case with typical symptoms in which the pigmentation was characteristic, but less in amount and extent than usual.

Hoch's case (*Klin. Monatsbl. f. Aug.* 1875, p. 58,) was an atypic but most decidedly pigmented case, and that of Magnus and Jacobson (*ibid.*, 1888, p. 202,) was the same. In the latter, the intense pigment-changes are shown in a chromo-lithographic plate. Germaix's case (*Ann. d'oc.*, 1893, p. 276,) occurred in a child of 11 during an attack of variola, but without ophthalmoscopic examination. and is, moreover, evidently not to be included in this category. In Cowell's case (*Trans. Oph. Soc.*, United King., Vol. 2, p. 58,) sight began failing at 14, and there was at the time of examination only a perception of light. "The pigment accumulations were much fewer than normal, and only sparingly stellate."

Leber (Ueber anomale Formen der Retinitis Pigmentosa. *Arch. Ophthal.*, 1871. XVII., Abth. 1, p. 314,) makes his class 2 consist of cases of "Retinitis Pigmentosa mit typischen Séhstorung mit anomalen Augenspiegelbefund," and his sub-class A, "die wohlbekannte retinitis pigmentosa ohne Pigment," which through many intermediate forms passes into the typical. Leber's expression, *wohlbekannt*. well-known, made me gasp for breath at first, until I came later to the sentence wherein he says that, in the ophthalmoscopic examination of these cases, "in spite of the failure of the pigment, the pigmentation is sufficiently characteristic to make the diagnosis clear." Cases without the characteristic amount of pigmentation, but with decided typical pigmentation, are necessarily not of the class under discussion. This quite shuts his cases out of our consideration, and when we find given no perimetric charts. no records of amblyopia or ametropia, no specific data of night-blindness, no precise statements as to the amount and kind of pigment-deposits, nor of other ophthalmoscopic findings, we are compelled to omit the reports as of helpful value to us. Moreover, of the three cases to which he vaguely alludes, without the mention of the typical symptoms, he speaks of one seeing better by night than by day, a fact that absolutely puts it out of our classification.

Pettlesohn (*Centralb. f. prakt. Augen.*, Bd. XII, p. 206,) quotes Donders and Schweigger (*v. Graefe's Arch.*. Vol. 1.) who pointed out, even so early, that contracted fields, night-blindness, and decline of the central visual acuity could exist independent of pigment-change in the retina and claimed that the two affections are identical. Donders observed that, "according to his idea. the pigment-changes were secondary and other than causative." Schweigger describes the visual failure in such cases to an affection more of the percipient than of the conducting portion of the visual apparatus. Leber lays stress on the fact that the essential character of the affection is not the pigment-change, but is really a coincident interstitial hypertrophy of the retinal elements. But, says Pettlesohn, Leber's cases, as observed by Schweigger, may belong to the so-called cerebral amauroses; namely, all presented visual failure and contracted fields even in earliest childhood.

He further says (and this was in 1888), "I have not yet seen a case reported in which their existed coincidently all the classic signs of ret. pig. without a pigmented fundus." He then details the following case seen in Hirschberg's clinic:

A 21-year-old lithographer complained that for two years his vision had been rather indistinct, and he was never sure of himself after dark. Investigation revealed that a 30-year-old cousin was similarly affected. although there was no consanguinity. The patient's sisters had perfectly good eyes.

O. D. — 2. S. — 2 Cyl. ax. 180° = 20/20.
O. S. — 4 S. — 2 Cyl. ax. 180° = 20/20.

At noonday, with good illumination, there was no contraction of the field, although with diminished illumination it shrank to within 10 of the fixation-point. There was no pigment to be found in the fundus, or if any, there were only the smallest flecks to be seen in the periphery. Three years later the patient returned for change of glasses. when the fundus was found studded with the characteristic stellate heapings of pigment, and even with perfect illumination there was a contraction of the field. Vision was unchanged. In the meantime (between 1885 and 1888) two younger sisters were said to be becoming affected in like manner although, unfortunately, could not be examined.

Pettlesohn says in conclusion: " We can now positively state what has long been thought probable, 'that retinitis pigmentosa sine pigment,' is identical with, and is only an early transitional stage of typical retinitis pigmentosa."

This conclusion seems quite convincing, though it by no means proves that there may not be stationary cases of retinitis pigmentosa without pigmentation. My patients seem to be examples, as no ingravescence has been noted in late years.

We are thus limited to five cases upon which we may rely as probably like, or similar to my own, one each of Perrin and Huidiez and two of Morton and one of Pettlesohn. It must not be forgotten, however, that in the reports of neither case are given some highly important details. No fields of vision for colors were taken by any with the perimeter, and Morton and Pettlesohn alone give the fields for white; the existence, or not, of central amblyopia is often not stated; the refraction is not specified, and there is a lingering doubt if the ophthalmoscopic examinations were made with the iris paralyzed—a prerequisite of accurate, and even then often difficult, examination of the extreme periphery of the retina. Moreover, in Perrin's case, there was some slight pigmentation and what existed was charasteristic of the common retinitis pigmentosa. It will be noticed that, as Leber writing in 1871, had not before him the report of a single case to justify his "wohlbekannte retinitis pigmentosa ohne Pigment," the expression according to his own contradiction, was meaningless, and its use was theoretically devised in the interests of classification and, perhaps, of prophecy, certainly not of history.

Wells (*Diseases of the Eye*, p. 529, Ed. of 1883,) alludes to Schweigger who, he says, noticed night-blindness and contraction of the field (only for white of course) "before the appearance of any pigment in the retina; but in all cases there was a marked contraction of the retinal arteries, whilst the older brothers and sisters had retinitis pigmentosa. He also observed this, in some rare instances, in older persons (between the ages of 40 and 50) who suffered from all the symptoms of retinitis pigmentosa, *e. g.*, "hemeralopia" from torpor of the retina, great contraction of the visual field, without any trace of pigmentation of the retina, or any other symptom except contraction of the arteries and paleness of the disc. In similar cases, von Graefe has subsequently found a deposit of pigment in the retina."

I have been unable to find Schweigger's printed words of a date prior to Wells, but in Schweigger's *Vorlesungen*, etc., (1890, p. 143,) there is an allusion to the histologic findings of certain cases which "ophthalmoscopically gave no indication of pigmentation." Graefe and Saemisch (1877, Band. 5, Th. 5, p. 641,) say that the pigment in retinitis pigmentosa "may be entirely wanting," but with "fine points and dots, a fine brown or black punctation upon a light ground at times pale yellow, more rarely yellowish-white spots alternating with dark." Swanzy says the pigment is, in some cases, "quite absent;" de Schweinitz, that cases occur with "the usual subjective symptoms, but without the accumulation of pigment:" Fuchs speaks of the existence of cases "without pigment," and "not necessarily associated with the presence of pigment;" Berry's words are, "not so very rare to find no pigmentary changes of the characteristic form." References to the subject by other authors are still more vague or uncertain, and are hardly worthy of quotation.

As to Consanguinity, Heredity, Etc.

In my cases there was no relationship in the ancestors, so far back as I could learn; not even the grandparents were cousins. In typical retinitis pigmentosa, consanguinity, according to de Wecker, exists in 33 per cent., and Liebreich says the percentage may be as high as 50. In Huideiz's case, the maternal grandparents were cousins, and one first cousin of the maternal grandmother, born of first cousins and aged 55, was congenitally night-blind.

My cases were almost surely examples of heredity, and in the typical disease it is estimated to exist in 33 per cent.

As to sex, in the typical disease, about 70 per cent. of cases are males.

A small proportion of patients are also afflicted with deafness.

I may observe parenthetically, that in both of my patients, there is a peculiar quivering and tremor of the fingers when the hands are held loosely extended. I have never seen anything like it; it is present in the normal brother and sister, is most intense in Case 4733, somewhat less so in the man, Case 4809. I do not know that it has any correlated significance, nor what is its cause. All are otherwise healthy, hard working people. This tremulousness, the mother informs me, was very noticeable in her husband, and existed all his life, although he had no night-blindness. In the case of the girl, (Case 4733,) there is also the slightest possible tremor of the eye-ground when she is tired, or has been subjected to long examination. It could hardly be called nystagmic in character.

Pathology.

In the typical disease, the histo-pathology is well understood. De Wecker calls it a retinal cirrhosis; others call it a sclerosis; the essential process consists in a hyperplasia of the cellular tissue of the pigment-layer with infiltration of its own pigment, *i. e.*, of that of its epithelial layer. Poncet's report in Perrin's case was as follows:

"The equatorial portion of the retina was sown with small pigment heaps, the principal flecks being somewhat irregular, between which was a general pigmentation more firm. It did not exist along the vessels, but was localized in the external granular layer. The reason that the pigmentation was not typical or stellate is, that this is due to the fact where the process is complete, the pigment is deposited along the sheaths of the vessels; but as vessels do not exist in the external layer, and, as in this case, the pigment did not pass beyond the external layer, it did not take the stellate form. The limitation of the field was in direct proportion to the pathologic pigment-change of the periphery. This process had its inception in the polygonal layer of the choroid." In Huidiez's case the same result was found, the pigment not having passed beyond the external granular layer of the retina.

In the articles on "Amblyopia" and "Amaurosis," in de Wecker and Landolt's *Traite complet*, Nuel divides nyctamblyopia into two classes, the congenital or hereditary, and the acquired. From the first class must be excluded the observations made in preophthalmoscopic days, and the author inclines to view the balance as cases of *retinite pigmentaire larvee*. either stationary or progressive, different cases showing all intermediate stages of nearly absent or typical pigmentation up to the characteristic retinitis pigmentosa.

Assuming, then, that my cases were pathologically and essentially of the same nature as those of Perrin and Huidiez, we have as the nature of the tissue-change a morbid cirrhotic process existing in the pigment layer of the retinal periphery, whereby the pigment infiltrates the retina in discrete punctate particles, but the infiltration is checked at the external granular layer, not, however, before having injured the retinal structure so as to destroy its functions as an intermediate of light sensation and color sensation. At this point the discrete pigment-infiltration becomes ophthalmoscopically visible as a half hidden punctate stippling. If the infiltration-process proceeds to its full extent, the pigment becomes heaped in large moss-like masses, and extends along the course of the obliterated capillaries, giving the typical picture of the completed and characteristic retinitis pigmentosa.

What starts the morbid process into existence, whether it is congenital or not, what checks it, if it is checked, what is its rate of progress, if progressive—these are questions that remain to be answered. Therapeutics is also inconceivable. It should be added, that we may feel absolutely assured that the morbid process is not confined to the retinal periphery; the limitations and irregularities of the color-fields of my cases clearly demonstrate that the whole retina is affected, and as my charts show, irregularly so. The limitations are relatively not concentric. But the microscope as yet fails to tell us of the infinitely small local changes that interfere with the responses to certain colors, permit them to others, while still not too extensive to prevent the general reaction to white. The indication is, that color-response is interfered with by a slighter degree of the infiltration-process than that occurring at the periphery, and one that so far has escaped the microscope. The explanation of color-sensation may result from a closer attention by the microscopist to the difference in tissue change between the periphery and the central part of the field, both in these cases and in normal retinæ. More microscope and less theory, might lessen the work of the eternal theory-makers as to the nature of color-reactions.

It is evolutionally of interest to suggest that the mechanism of normal reaction to certain colors has developed later in the biologic process, and that the peripheral reaction was established subsequent to the central; hence, according to well known atavistic laws, the more unstable later acquirement of certain color-reactions, and of all sensation at the periphery of the retina, are the first or more frequent to fail in congenital exceptions, and in acquired diseases. A proof of this is the very fact of the differences in extent of the normal color-fields, the greater amount and the more constant of the colors having relatively the more extended retinal reactions, white, of course, exceeding all.

Not to wander too far afield, and into glimpsed by-paths, I have a fancy that these five cases illustrate a phase or grade of disease, of which the albinotic eye is an extreme type. It would be almost if not absolutely impossible to prove, but I wonder if the albino has not greatly contracted fields, and if the nystagmus is not a device, partly to find a less exhausted and more sensitive portion of the retina, but also by this means to get images of lateral objects on the central and reacting portion of the retina, without motion of the head. Of significance is the fact, that the nystagmic movements are lateral, not vertical. However this may be, it is highly desirable that there should be a scientific study of the chromogenesis of normal and pathologic pigmentation, including perhaps, therapeutics. Some one, let us hope, will some day learn the cause and, hence, the prophylaxis and cure of albinism—and what a benefactor he will be!

Returning to our subject, I would conclude by a suggestion that these cases of non-pigmented, peripheral retinal atrophy are possibly more numerous than we suspect. Both of my cases had passed through the unsuspecting hands of other good oculists—and with no discredit to them, surely. Argon was discovered only a year or two ago. Habit and a sensitive nervous organization enable such patients to circumvent and compensate for their partial night-blindness, at least to forget it, and unless the oculist draws them out by questioning, they would not volunteer the recital of the subjective symptoms. The perimeter alone tells of the objective symptom, and on a busy day the making of ten perimetric charts of one patient, is a task we are none too anxious to undertake.

I would finally suggest:

1. Inquire of every office patient, if he sees as well at night as other people; watch for the "bowed-head sign."

2. Test every patient (it takes but an instant) with finger movements at 90 degrees to the patient's temporal sides.

3. In doubt, test the extent of the field at least for white, with the perimeter.

4. If there is a narrowed field, carefully examine (under mydriasis) the periphery of the retina, as to its pigmentation.

5. If a case is found, report it, and besides the usual history and data, give also carefully made perimetric charts for white and the four principal colors; record also. the central acuity of form, and the exact (mydriatic) error of refraction.

The important facts to determine, are:

(*a*) Is the disease progressive?

(*b*) If so, is it the incipient stage of what later becomes typical retintitis pigmentosa? Typical cases in brothers and sisters, or inherited from an ancestor with the typical disease, would greatly help to determine this.

(*c*) What is the pathology of the abnormal color-fields?

(*d*) What is the etiology of the disease?

HEMORRHAGIC GLAUCOMA—REPORT OF A CASE, WITH MICRO-PHOTOGRAPHS.

BY. E. C. ELLETT, M. D.,

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FORMERLY HOUSE SURGEON IN ST. AGNES' HOSPITAL, AND THE WILLS' EYE HOSPITAL, PHILADELPHIA; OPHTHALMIC AND AURAL SURGEON TO ST. JOSEPH'S HOSPITAL, AND TO THE CHILDRENS' HOME, MEMPHIS, TENN.

Illustrated.

On May 11th, 1896, Mrs. T. B., aged 62, consulted me in regard to poor vision in her left eye. A month before I saw her she had a spell of vertigo, and momentary blindness. On recovery she noticed that the vision of O. S. was poor, and she thought it had become worse since then. There was no pain or redness. The pupils were of equal and normal size, and acted well, the left one a little sluggishly. Consensual action was preserved. She had been treated for chronic indigestion and for gall stones, but when I saw her, was well.

I found O. D. normal, and vision equal to 20-30.

In O. S. I found the vision reduced to counting fingers at three feet. The ophthalmoscope showed a swollen nerve, and the typical picture of hemorrhagic retinitis. There were the flame-shaped hemorrhages all over the eye ground, none of which were very large. The vessels were tortuous. The only peculiarity I noticed was the arrangement of the hemorrhages in the macular region. They radiated from the macula exactly as the exudation deposits do in a typical case of retinitis albuminurica.

I could find no gross vascular disease, nor any cardiac lesion. The urine had a sp. gr. of 1020, contained a little albumen and a very few narrow granular casts.

I gave a bad prognosis for sight, and cautioned her to be careful of the condition of her digestive apparatus, to keep her bowels open, to avoid worry, excitement and exertion, and explained to her the possible bad outlook, not only for her eye, but for her general health. I further informed her family physician of the condition of her urine and the nature of the eye trouble, that he might add his influence to have her take proper care of herself.

On the 6th of June she returned, saying her eye had been red and painful for five or six days. I found a sub-conjunctival hemorrhage in the left eye, the ball injected, pupil a little dilated and fixed, vision equal to counting fingers at two feet, and tension + 1. There was no change in the condition of the eye ground.

I gave her eserin, 1 grain to the ounce, and advised moist heat as a local application. Two days later I found the eye still painful, cornea a little anesthetic, and tension elevated. Leeching relieved her symptoms, and the puncture in the skin was soon surrounded by a circle of effused blood. For a month the eye remained in pretty much the same condition. Eserin, pilocarpin, leeches and heat added to her comfort, but without some such means the pain was quite severe. The iris became hyperæmic, but never inflamed.

On the 12th of July, the symptoms growing steadily worse, I made an upward iridectomy under cocain. There was free hemorrhage from the cut iris, and the operation was followed by the most intense pain, such as I have seen but very few times after this operation. Moist heat and morphia rendered her more comfortable, and the bleeding ceased. The eye did nicely, except for a slight entanglement of the inner pillar of the coloboma, and two weeks after the operation I noted no pain, the anterior chamber clear, a good coloboma, and the ball whitening under the influence of eserin. This lasted till August 8th, nearly a month after the iridectomy, when I was called to her to find her in considerable pain. Leeches relieved her, but the next day the pain was worse, and there was a fresh hemorrhage into the anterior chamber. The pain could not be relieved and as the suffering, combined with the intensely warm weather was depressing the lady very much, I advised enucleation, which was readily agreed to. On the 11th of August I removed the eye under chloroform, choosing that anesthetic on account of the condition of the kidneys. I did not dress the eye till I was satisfied that all bleeding had ceased, when I applied a compress and roller bandage. On reaching my office I was met with a telephone message to return to the house at once, and there I found her, recovered from the anesthetic, in great pain, the dressings saturated with blood, which was dripping from them down her cheek and on to the bed. On removing the dressings I found the orbital tissues infiltrated with blood, the lids blue and much swollen, and some blood coming from the socket. I could not separate the lids enough to find the bleeding point, so that I had to rely on pressure, which soon stopped the bleeding. Convalescence was quite protracted, and for some weeks there was numbness over the distribution of the infra-orbital nerve. The blood was slowly absorbed, the numbness disappeared, and on the 12th of September I dismissed her with a very respectable socket. The urine, under the influence of diluents, had fallen to sp. gr. 1009, and I could find no albumin or casts.

I have seen this lady at intervals, and she has never had any trouble with the right eye, and her general health is unusually good. The socket becomes irritated when she attempts to use an artificial eye.

The eye was hardened in 5 per cent. formol, bisected equatorially, stained in borax-carmine, imbedded in paraffin, cut and mounted in balsam.

On looking over the sections I was first struck with the freedom from degeneration. All the tissues stained clearly, with the single exception that in one section the nuclei of the muscular coat of the central artery of the retina did not show very distictly. There was no degeneration, however.

The cornea was intact. The healed tract of the iridectomy wound could be seen with high power (Fig. 1), but otherwise the membrane was normal.

The sclera was thinned a little. The iris was also a little thinned, but all its elements took the stain well and showed no evidence of degeneration. The vessels were closely studied, and no change could be detected.

The angle of the anterior chamber was occluded (Fig. 2.) by adhesion of the root of the iris to the cornea for 1 mm. beyond its normal attachment. Fontana's spaces were accordingly obliterated, and the canal of Schlemm could with difficulty be made out.

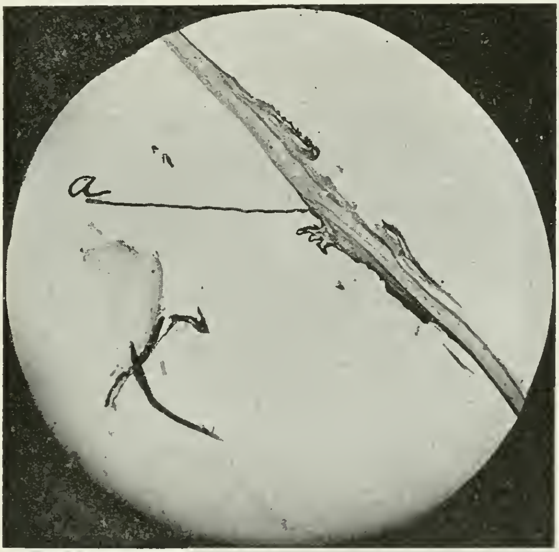

Fig. 1. The angle of the anterior chambèr showing the stump of the iris after iridectomy *(a)*, and occlusion of Fontana's spaces and the canal of Schlemm.

The ciliary muscle was attenuated, but the ciliary body was otherwise in good condition. In several places the vessels were well seen, and no traces of degeneration of their coats or dilatation, or hemorrhage were appreciable. The choroid was also healthy.

It was in the retina that almost all the pathological interest centered. The changes here, with one exception, were confined to the nerve fiber layer, and consisted in aneurisms, dilatation of the arteries (Fig. 3), venous engorgement, and hemorrhagic effusions into this layer.

Repeated careful study of many sections failed to show any degeneration or inflammation of the vascular coats. The aneurismal sacs were, in the main, empty, while the veins and undilatated arteries were full of blood. What was seen ophthalmoscopically as retinal hemorrhages, showed microscopically as hemorrhagic infiltration of the nerve fiber layer. The only change in a deeper layer was one spot, where a clot, attached to the retina, separated it from the choroid. These retinal changes were strictly back of the equator, and more numerous near the nerve, corresponding to the ophthalmoscopic picture of the disease. From the equator to the *ora serrata* the vessels were normal. The disc was cupped to a moderate extent (Fig. 4). The central artery of the retina was dilated, but its coats were otherwise healthy.

Microscopically, aneurismal dilatations showed very well, as is shown in the accompanying figure (Fig. 5).

In order that I might fully appreciate the changes manifested, I availed myself of the assistance of Dr. Wm. Krauss, a most competent microscopist of this city, in the study of my sections, and I wish to express my thanks to him for his kindness.

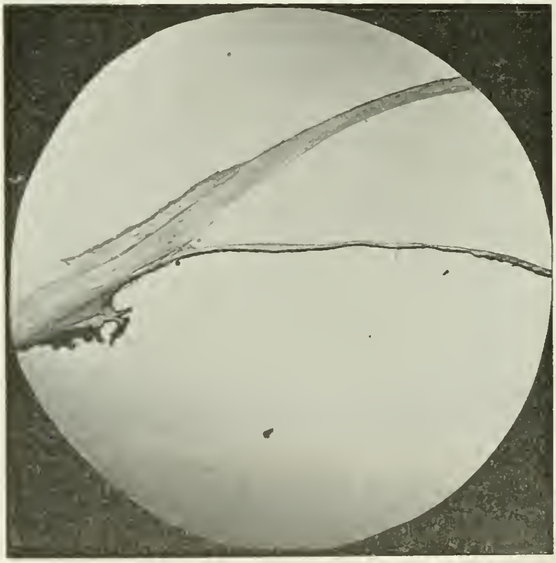

Fig. 2. The angle of the anterior chamber showing occlusion of Fontana's spaces and the canal of Schlemm.

Hemorrhagic glaucoma must be recognized as a distinct disease, rather than as a form of glaucoma. Especially should it be distinguished from hemorrhage into a glaucomatous eye. "It is characterized by an attack resembling acute or sub-acute glaucoma taking place at an interval of weeks, or even many months after an intraocular hemorrhage, which is usually dependent upon the degenerated condition of the vascular system. due possibly to senility, or maybe in association with albuminuria" (Stirling). Valude and Dubief also lay stress on the point that this is a disease which commences by intra-ocular (retinal) hemorrhages. It is always then preceded by hemorrhagic retinitis. The opposite does not hold true, for we all see many cases in which the retinal hemorrhages constitute the whole disease, sight being usually lost, it is true, but there is never any pain, hypertonus, or other phenomena of glaucoma. We are not yet able to say just which cases will develop glaucoma, or why it appears when it does come, but the possibility should be borne in mind when giving a prognosis in a case of hemorrhagic retinitis. Bourgon describes the history of these cases in two periods:

(1) A hemorrhagic period.

(2) A period of confirmed glaucoma.

This division will not only be found convenient from a pathological point of view, but a study of my own and other reported cases shows that this division is of great clinical importance. Noyes also calls attention to the fact that the hemorrhage is the occasion of the outbreak of the acute symptoms. In arriving at a diagnosis when opacities of the media prevent a study of the eye ground, a point of considerable diagnostic value, emphasized by Noyes, is that the loss of sight precedes the more char-

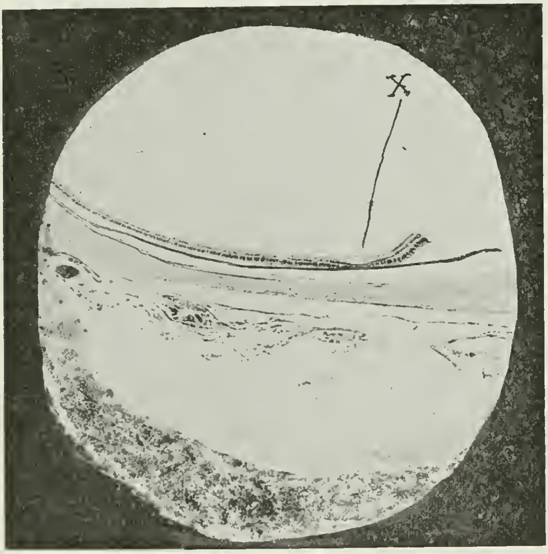

Fig. 3. The coats of the eye, between the equator and the optic nerve, showing aneurismal dilatation of retinal vessels at X.

acteristically glaucomatous symptoms. This affection, then, differs from ordinary glaucoma in that the latter is a local affection, or at least not dependent on gross lesions elsewhere, while the former is retinal and dependent on circulatory degeneration (Valude and Dubief).

This affection, even more than ordinary glaucoma, manifests itself late in life. Of 14 reported cases at my command, where the age was given, I find it—

Between 40 and 50 - - - - - - - 2.
Between 50 and 60 - - - - - - - 4.
Between 60 and 70 - - - - - - - 5.
Between 70 and 80 - - - - - - - 2.
Over 80 - - - - - - - - - - - - 1.

It may occur in apparently healthy persons at as early an age as 26 (Weinbaum), though this is certainly very rare. Indeed, it is a rare disease, at any age. Bourgon saw it once in over 6,000 cases; Stirling estimates it as 1 in 5,000; Risley saw it 4 times in 20,000 eye cases. Fortunately, it usually affects one eye (Noyes), though instances are not lacking where both were affected (Oliver). Risley found it binocular 4 times in 20 cases.

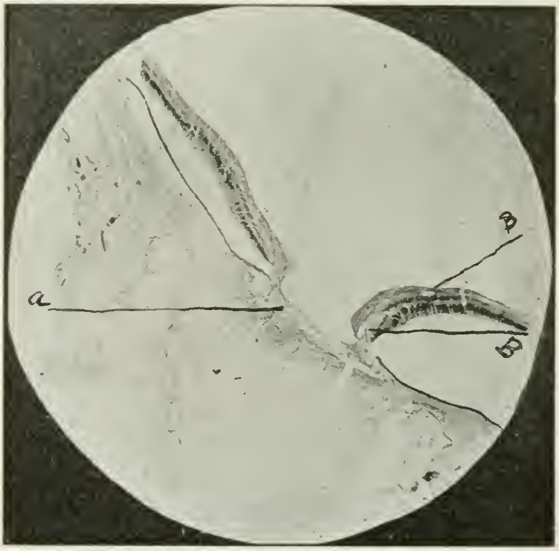

Fig. 4. The optic nerve entrance, showing the glaucomatous cup, the central artery of the retina (*a*), and "vacuoles" (*b b*).

Ocular Pathology.

In studying the pathology of eyes affected with this disease, we find certain structures of the organ constantly affected, and others only occasionally.

Cornea.—There is no corneal lesion demonstrable after death with any degree of frequency in these cases. In one case Weeks found a pigmentation of all the cornea except the periphery, dependent on a deposit in the substantia propria, and Alt's case showed "glass warts" on the periphery of Descemet's membrane. With these exceptions I find no mention of any change in the cornea except the steamy look common to all glaucoma. Many explanations are offered for this, it being usually put down as edema, but I have never seen in print the one which appears to me to be correct. If you take the eye of an animal after it has been removed and hold it between a finger and thumb, you can by pressure make the intra-ocular tension as great as you please, and you will notice that as you increase the intra-ocular tension in this way the cornea takes on this steamy look, passing to a pronounced opacity, and clearing up perfectly when the pressure is removed. Recalling that the cornea is made up of superimposed layers, after the order of a lattice-work, and that the transparency of the cornea depends on the physical relation which these layers bear to each other, it is easy to see how a disturbance of this relation will destroy the transparency of the membrane. This is

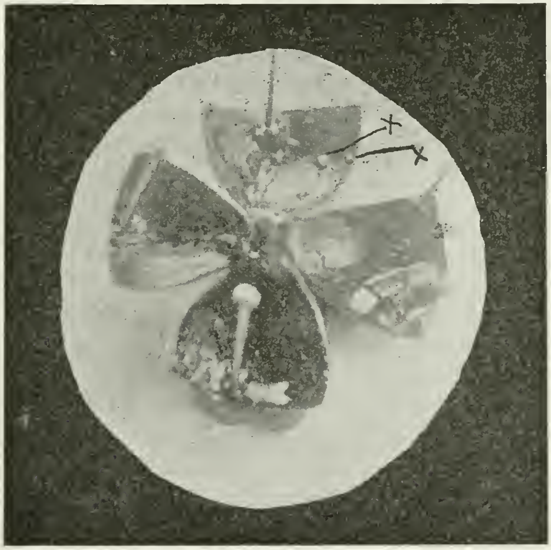

Fig. 5. The posterior half of the ball, showing aneurismal dilatation at X and X.

certainly what happens in the enucleated eye, edema being clearly out of the question, and to my mind it is the explanation of the corneal changes in glaucoma.

I wish to say that this idea is not original with me. I am indebted for it and many beautiful demonstrations of it to Dr. S. Lewis Ziegler, of Philadelphia. I am not aware that Dr. Ziegler has ever published it.

Filtration Angle and Anterior Filtration Spaces.—In the majority of instances these will be found closed, though they may be open (Stirling, de Schweinitz, Weinbaum, Oliver). Valude and Dubief found them closed in some of their specimens and not in others, and think it is a result and not a cause. They may not be closed, but so choked with debris as to seriously impair their function (Oliver). At any rate inflammatory products (Birnbacher and Czermak), and sometimes hemorrhages (Norris), are found around the canal of Schlemm.

Iris and Ciliary Body.—Changes are found here quite similar to those found in the choroid, and these structures are a little more prone than that membrane to be involved (Valude and Dubief). The vessels may be sclerosed, ruptured, or the seat of hyaline degeneration (Stirling); there may be inflammatory infiltration (Valude and Dubief), posterior synechia (Alt) (a tendency to iritis has been several times noted), ciliary engorgement (Oliver, Alt), and even hemorrhage into the ciliary body (Oliver). The iris may be atrophic (de Schweinitz, Alt), as may the ciliary body (Alt). My specimens show that the iris and ciliary body may share the immunity which the rest of the uvea enjoys.

Choroid.—I have just said that this membrane may be normal. The changes met with here are very variable, and are, in general, exactly what were mentioned as being found in the iris and ciliary body. Venous engorgement is the most frequent change (Valude and Dubief, Randolph, Alt), though this may be confined to the anterior segment, with phlebitis and stenosis of the veins as a secondary change (Birnbacher and Czermak).

Retina.—The retina is the structure which is constantly found the seat of changes, since it is the changes here that set up the disease and give it its identity. Vascular degeneration is almost constant, that is, sclerosis and hyaline degeneration (Stirling, Valude aud Dubief). Less constant than these changes, but second to them in point of frequency, are retinal "vacuoles" (Valude and Dubief), which are either dilated vessels or cavities left after absorption of hemorrhages. These are more numerous near the disc, and in my sections are beautifully shown in this locality. Alt found hemorrhages all through the retina, clear to the *ora serrata*, which is unusual, and microscopically the retina in his case shows what Iwanoff terms cystoid degeneration, due to former hemorrhages. To illustrate the frequency of the vascular alterations, Edmunds and Bailey found them in 16 out of 17 eyes, with inflammatory deposits along the veins. Randolph noted degeneration of the muscular coat of the central artery of the retina. Dobrowsky and Oliver found perivasculitis. Norris found hemorrhages in a recent case with sclerosed vessels, and Weinbaum and Alt found pronounced venous thrombosis. There may be also dilatation of the vessels, aneurismal or general, and deep hemorrhages (Oliver, de Schweinitz, Alt), though the hemorrhages are usually in the nerve fiber layer. Weinbaum's case was peculiar. A large thrombus, $\frac{3}{4}$ mm. long, occluded the central vein $1\frac{1}{4}$ mm. behind the lamina cribrosa, with no other changes in the retinal vessels, and cystoid degeneration of the *pars ciliaris retinæ*. He is not certain whether these changes or the glaucoma were primary. Alt's case showed circumscribed hemorrhagic retinal detachment, as was seen in my own, endarteritis and pigment degeneration of the walls of the smaller vessels.

Optic Nerve and Posterior Filtration Channels.—The changes in the vessels have been described and the occurrence of hemorrhage is sometimes noted (Oliver). In addition to these, the nerve itself partakes of the classical glaucomatous change, the cup. This has been noticed in many specimens, and seems to be a fairly if not absolutely constant lesion. The posterior filtration channels, like the anterior, are sometimes found occluded (Valude and Debief).

Vitreous.—The only mention of any change in the vitreous is by Alt, who found it to contain blood, "especially in its outer portions, and near the *macula lutea*."

General Pathology.

Accompanying these local changes general arterio-sclerosis is almost constant. Risley found it in his three cases.

Valude and Dubief noted its presence. Fuchs finds it either as a part of general senile changes or as a separate condition. Kollock calls attention to albuminuria, and considering the close relation between the chronic interstitial form of nephritis and arterio-sclerosis, I am inclined to believe that the former condition will be found in many cases. It was present in my own, and I have noted it in cases of hemorrhagic retinitis, which have, so far, failed to show glaucomatous symptoms. The uric acid diathesis has also been called on to shoulder some of the blame (Suker).

Pathogenesis

We are not here confronted with the difficulties or multitude of theories which surround the question of the etiology of ordinary glaucoma. Most observers agree that the distinctive retinal origin of this form stamps it with individuality, differing in this particular, according to Poncet, from ordinary glaucoma, which is of uveal origin (Valude and Dubief), though Dunn holds that it may follow uveal as well as retinal hemorrhage.

It must be said that Treacher Collins thinks there is an analogy between this and primary glaucoma, and that both the hemorrhages and the hypertonus are the common results of some unknown factor. To this view no others subscribe, except Alt, who thinks "the cause can only lie in a peculiar previous condition of such eyes when attacked by retinal hemorrhages." Valude and Dubief are quite positive in their conclusions, and think that the glaucomatous symptoms are due to mechanical obstruction of the whole ocular circulatory apparatus. They find in the arterial degeneration a considerable impediment to the circulation, with consequent slowing of the venous current, dilatation of the veins and thrombosis. The hemorrhages appear either by diapedesis or *per rhexin.* In the unusual cases where miliary aneurisms form, their walls may give way. Certainly in many cases of hemorrhagic retinitis, careful ophthalmoscopic examination fails to show vascular rupture, and even in those cases where it is demonstrable in some portions of the eye ground, the effusion is, as far as ocular inspection goes, by diapedesis in others. These authors hold further, that in the absence of large or numerous extravasations of blood, serous exudations may be the cause of the glaucomatous symptoms. This, we rememoer, is a reversion to Graefe's theory, who thought to explain the symptoms of glaucoma by assuming the presence of serous choroiditis. Alt is very positive in doubting this to ever be the case, and thinks hemorrhagic glaucoma is always induced by hemorrhages. On the whole, the explanation offered by Valude and Dubief ratner hinges on the theory of Weber, as they say, in spite of the failure of this theory to adequately explain ordinary glaucoma. Alt thinks hyperopia is at the bottom of the trouble. He has shown that the iris angle is smaller and the anterior chamber more shallow in short eyes, conditions which favor the development of glaucoma. Plugging of the filtration spaces due, in these cases, to blood, precipitates the attack.

Hemorrhagic glaucoma, then, is a local expression of the general condition and "not truly a glaucoma, and the error of the designation leads to prejudicial errors in regard to treatment." Risley rather leans to the immediate cause of the increased tension being changes in the anterior and posterior filtration spaces, these being due to the circulatory disturbances, and so we see that he, too, inclines to Weber's hypothesis. There is unanimity of opinion as to its being a secondary affection (Dobrowsky, Hotz, de Schweinitz, J. L. Thompson, Noyes, Fuchs, etc). Richey considers the differential features to be "rotten vessel walls, too weak to sustain the increased arterial tension." Noyes has found cases which unmistakably pointed to embolism of the central artery of the retina, with consecutive hemorrhage, as the starting point of the glaucoma, and thinks the hemorrhage is undoubtedly the occasion of the acute symptoms. De Schweinitz says it may follow the ocular changes of albuminuria, and Kollock reports a case in which this was observed to take place. There can be no doubt, then, that whatever may be the cause of ordinary forms of glaucoma, this form is secondary, and due to the circulatory disturbances (both lymph and vascular,) which follow degeneration of the retinal vessels, acting, most probably, in the way explained by Weber in his theory of glaucoma.

Prognosis,

There are few diseases of the eye that offer as little hope for relief as hemorrhagic glaucoma. This is not only because it is fatal to sight; that is already gone; but in the large majority of cases the ball itself must be sacrificed. This, we see, is a very different outlook from that which obtains in ordinary glaucoma, and for this reason, says Risley, "it is important that the line should be drawn between hemorrhagic and ordinary glaucoma, since on one side lies a hopeful prognosis, while on the other both experience and pathology join hands to teach us the limits of our art." In 28 cases (eyes) which he has collected, the vision was lost in all, and 24 were finally enucleated. Iridectomy offers no hope, and pain often necessitates enucleation (Schweigger). In response to Risley's letters an almost uniform subscription to this opinion was expressed. Hotz believes that no kind of operation will save the eye. Wadsworth gives a fatal prognosis to sight and ball. Ayers finds a well executed iridectomy usually fails to save the ball. Norris obtained relief for nine days by iridectomy, and then the glaucoma symptoms returned. An attempt at optico-ciliary neurectomy was followed by a profuse hemorrhage into the capsule of Tenon, necessitating enucleation. In this connection a somewhat similar accident in my own case testifies to the general vascular degeneration often present. Kollock was compelled to enucleate after the failure of eserin and sclerotomy. Noyes also testifies to the frequent failure of iridectomy and sclerotomy, and the consequent necessity for enucleation. With this, Fuchs and de Schweinitz agree. Oliver was compelled to enucleate after the symptoms had been held in abeyance six weeks by an iridectomy. Hubbell had to enucleate two eyes, and concluded that "this disease is fatal to vision, and palliative and tentative treatment is of no avail." Bulson enucleated an eye after the failure of an iridectomy. The symptom which demands enucleation is constant and uncontrolable pain.

In opposition to the gloomy views I have quoted, I find that Schweigger's later opinion (the first quoted being from his text-book,) is not inclined to so unfavorable a view of the prognosis of iridectomy as is usually stated. Randolph thinks that iridectomy offers temporary, and maybe lasting, relief; but in this sanguine view he stands alone. Oliver has had relief in one case follow two iridectomies, and the removal of the lens. There was a relapse after the first iridectomy. On account of a successful iridectomy, Hotz does not think the glaucoma in his case depended on the retinal hemorrhages. Wheelock saved an eye with a little sight by sclerotomy and iridectomy.

The prognosis of this disease is not limited to its effects on the eye. On account of the accompanying vascular condition "death usually comes by intra-cranial effusion from the same cause" (Richey). White lost two cases from apoplexy, and only by heeding the warning which the local condition gives can we save our cases from a similar fate.

Treatment.

The treatment naturally varies according to the stage. Following his division into two periods, Bourgon treats the first period by sedatives, myotics, moist heat, ergot and the iodide of potash. Among the sedatives he uses bromide of potash, and joins Stellwag and de Schweinitz in testifying to the favorable influence of chloral hydrate. The myotic in this stage should be weak, $\frac{1}{10}$ of a grain of eserin to the ounce. The bowels should be kept soluble, and diligence exercised to avoid any imprudence which might result in their disturbance. One of Risley's cases relapsed after iridectomy, as the result of an attack of cholera morbus, and the effect of vomiting would be equally or more disastrous. Emotional excitement, since it is known to bring on attacks of glaucoma, should be carefully avoided, as well as all sources of worry and anxiety. Eye work should be interdicted, as a matter of course.

By these means many cases of hemorrhagic retinitis will go no further. Unfortunately some will pass, slowly or quickly, into a "period of confirmed glaucoma," and this condition will tax the skill and resources of the most capable ophthalmologist. Here we may resort to stronger solutions of eserin and pilocarpin locally, leeches to the temple and chloral internally, with all the attention to the secretions and general condition that were employed in the first period. The question of operation soon presents itself. After a careful review of the opinions of others, Risley says- "I would first of all do sclerotomy or paracentesis of the vitreous, and having by this means relieved the tension of the globe and possibly secured a deeper anterior chamber, perform either a free anterior sclerotomy or, if the iris were moderately healthy, a broad iridectomy."

Wolfe says: "With a moderate anterior chamber, and the iris not quite atrophied, I perform a large iridectomy, not with any sanguine hope of giving vision, but to save enucleation. I prefer in extreme cases the puncture of the sclerotic, and allowing the escape of a very little of the vitreous."

De Schweinitz does not countenance iridectomy, but advises posterior sclerotomy, with the patient's consent to enucleation if it fails. My own case shows that iridectomy may fail, even when the iris is healthy. There is much danger in opening the ball, that fresh intra-ocular hemorrhage may occur from relief of tension. For this reason Oliver advises that evacuation of the aqueous humor should be very slowly performed. If an iridectomy is done, free bleeding from the iris is the rule, but this seldom continues after the anterior chamber is filled with blood, and the blood is subsequently readily absorbed. The fact that after the failure of one operation (sclerotomy or iridectomy,) a second or third may do some good, should be borne in mind. But, in spite of all the care and skill, we are nearly always brought face to face with the "last scene of all"—enucleation. Should the necessity of this arise, the liability to free bleeding should still be borne in mind, and all precaution taken to prevent it, if posssible.

From what has preceded, I draw the following conclusions:

1. Hemorrhagic glaucoma is a form of secondary glaucoma, following, and dependent on hemorrhagic retinitis.

2. It is always associated with, and related to, general arterial degeneration,which in turn is often due to a chronic kidney lesion.

3. In eyes affected with this disease we usually find degeneration of the retinal vessels, with hemorrhages, choroidal congestion, atrophy of the iris and ciliary muscle, occlusion of the filtration channels and cupping of the disc Miliary aneurisms of the retinal arteries are occasionally seen.

4. The prognosis is almost without exception fatal to sight and to the ball, and it is often a forerunner of cerebral apoplexy.

5. The medical treatment of weak myotics, sedatives and rest should be begun during the "hemorrhagic period."

6. If the "period of confirmed glaucoma" comes on repeated local depletion and repeated sclerotomy, in addition

to the medical treatment, offers the best hope for retarding the disease.

7. All operative measures are peculiarly prone to be followed by free bleeding.

8. In the large majority of cases, enucleation is finally indicated as the only relief from pain.

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THE OBJECTIONS TO THE THEORIES OF THE HARMONIOUS SYMMETRICAL ACTION ON THE OBLIQUE MUSCLES IN OBLIQUE ASTIGMATISM.

By Will Walter, M. D.,

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The recent and renewed arguments of Dr. Savage, and the elaborate work indulged in by him to prove the distortion of retinal images in oblique astigmatism as the sine qua non of a so-called harmonious symmetrical action of the obliques, call for a resumé of the objections to the related and, according to him, dependent theories promulgated, and a discussion of some point in regard thereto.

In the beginning the first objection, *i. e.*, as to the alleged alteration in the direction of the lines—the distortion of the rays *per se*—is conceded to be not valid, though the importance of the distortion is not allowed.

In support of this objection the fact has been brought out in the discussion that the distortion shown in the photographs exhibited by Dr. Savage, showing the deviation in a degree marked circle,* was far in excess of that in the eyes with a corresponding degree of astigmatism, due to the relatively low focal length of the camera lens compared to the ocular lens system: a point not brought out is that the camera sensitive plate being flat would show a greater eccentric deviation than the curved retinal sheet of the eye. However, these statements do not alter the proofs; the observers rather sanction them, since if there be the deviation in high degrees there must be for low, however slight it may be. This is one of the primary arguments of Dr. F. B. Eaton, the chief opponent of the theories, who found that if he held a — 2.00 cylinder obliquely before the eye at 13'' there was produced a deflection in the line through 6°, while close to the eye it was 0.75°, and concluded that at the corneal surface it must be very slight.

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I should say, parenthetically, that these photographs were made, I am informed by Dr. Perry who took them, with a photographer's lens, marked $4\frac{3}{4}$'' focal length, and that the cylinder used was found to be 0.62 d. in strength. My estimates make this combination approximate 4.00 d. of corneal astigmatism, maximum obliquity. The distortion amounts to about 1.75°; 1.75° of deviation at the circumference of the circle, whose diameter is 88 mm., is equal to about 1.33 mm. (2 II. r. $\div \frac{360}{175}$). Given a diameter of the correlative retinal impression and a curved surface like the retina, the maximum peripheral deflection would be very small, even with this not very common amount of astigmatism. And it has been claimed that the distortion is sufficient, even in an astigmatism of 0.25 or 0.50, at an obliquity anywhere from 5° to 45° to require a rotation to overcome the incoincidence of the formed images.

A second contra argument is that torsion of the eyes in convergence is physiological, and does not produce diplopia because of habitual neglect of images outside of the immediate region of the macula.

To prove that torsion is physiological, several experiments have been quoted and reproduced. The *first* is that of Meissner, as modified by La Conte, to determine the horopter, viz.: A piece of thread is held vertically before a window pane $\frac{1}{2}$ inch from it; the eyes fixing upon a speck in the glass behind the middle of the thread, two threads produced are seen to converge below, due to rotation of the eyes outward. The *second* is that of Dr. Eaton, consisting of a thread several inches long with a knot in the middle, fixed with moisture upon the glass; fixing upon the knot we approach the object to say 6'', when the ends appear to divide—are seen double.*

La Conte and Meissner have claimed that the vertical meridians of the corneæ are parallel and vertical when the plane of vision is depressed 45°.

To test these points I have made a simple apparatus, an improvement, I think, over Eaton's scheme: A long narrow (corset) box is used; the cover is removed, one end taken out and the sides cut down diagonally from the intact to the open end, 33 cm. in my test; a vertical line is drawn within the closed end midway between the sides, and directly in line, 1" or 1½" within, is stuck a black pin carrying a letter E near its head. A notch is cut in the open end to fit over the nose crest. As I look at the E on the pin I see two homonymous images of the line; in the primary position they converge slightly above, showing rotation outward; at about 45° below they appear parallel, in extreme depression divergent above, in extreme elevation convergent above, so as actually to appear crossed at the top. All this, in my eyes, is identical with Herring's assertion that "in general the vertical diameters of the globe undergo in symmetrical positions of convergence of the visual lines a rotation, in the course of the inferior obliques, so that their upper ends diverge more when the visual plane is elevated, and converge less when it is lowered than is the case with parallel visual lines and similar positions of the visual plane."

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*It has seemed to me that this effect might be due, in part at least, to disparity caused by the incoincidence between the thread, outside the fixation point, and the horopter circle.

As I want to show what relation there may be in extreme lateral positions of the eyes, I have a space in my records for three positions to each side. In my own case I note that in extreme lateral version the rotation is increased and occurs in the eye which is adducted, and that rotation is greatest in extreme lateral upward version. Further, I can see no blurring of the E of fixation, even when the lines indicate extremest rotation. Eaton claims that the outward rotation begins at 20" in some eyes free of all asthenopia, when slight vertical diplopia is produced and an elevation of the visual plane 20° will render it apparent when the line is 22" distant.

The main point in these proofs to me in this connection is not that rotation occurs, but that the peripheral diplopia produced does not interfere with clearness of vision for the maculæ, and hence there would be no need of compensatory rotation, even if there be peripheral disparity of images.

Not to go deeply into the part the recti take in rotating the globe, suffice to reiterate that the contra claims are that the recti produce torsional effects of greater and the obliques of less importance than claimed by Dr. Savage, and that the former predominate over the latter.

Another point in the opposition, which has been brought out in the discussion, an argument adduced by Eaton in

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NOTE—My tests, though limited in number, seem to indicate that this rotation is far from being the rule, and that where present, hyperphoria should be looked for.

'93, is demonstrated by this square (a) and + 3.00 D. cylinder. Hold the cylinder over the lower right hand corner, axis 45° right eye, in such a way that the eye will see the balance of the square. An obtuse angle is formed. Now, it is apparent that if the square is rotated till the line inclining downward to the left approaches a horizontal, which is equivalent to compensatory rotation of the eye for that meridian, the line to the right already leaning, is thrown still further away from the perpendicular, which should be a coincident line in binocular single vision; thus rotation is accomplishing its purpose, for the horizontal increases the incoincidence and defeats its purpose for the vertical line. Dr. Savage does not attempt to explain this but says frankly that while there is no way to show why there is greater tendency to fuse horizontal than vertical lines, such is the case.

The main objections to the theories are then, briefly:

1. That oblique astigmatism does not produce relative displacement of retinal images.

2. That falling upon disparate retinal points there would be no diplopia because of the habitual neglect of images falling outside the macular region, rendering compensatory rotation unnecessary.

3. That rotation of the vertical meridians outward when the visual plane is above and inward when below 45° of depression, is physiological.

4. That the torsional effects of the obliques is less than that of the recti.

The invalidity of the first is granted, though the amount of the distortion is certainly inconsiderable for any degree of astigmatism encountered. Its importance is admitted for the sake of argument. The third would prove that the second is true, for if there be habitual rotation for all planes above or below 45°, and the usual plane of vision is depressed only 15°, suppression of the peripheral double images must be habitual, or the disparity so immeasureable as not to be apparent. It has been determined by the haploscope that the retinal meridians which correspond are not exactly vertical, that the middle longitudinal sections form an angle of 3° or less with each other, diverging above and converging below, so as to meet at a finite point. Helmholtz hence called them the apparent vertical meridians, and proved in himself that in the act of walking, images of points upon the ground appeared single, *i. e.*, fell upon coincident points, the eyes being fixed upon or a little below the horizon.

The horopter being a circle passing through the fixation point and the nodal points of the eyes; the fact that outside of this—except for the points which happen to lie in line horopters—all objects cast images upon disparate points, has led observers to ask why, indeed, this peripheral disconsonance is not productive of diplopia; and it is peripheral diplopia which compensatory rotation is destined to correct. We know that this disparity is the rule, and that far from requiring fruitless compensatory effort, it is utilized through subconscious receptivity and gives us valuable evidence of depth and solidity. Then this disparity is infinitesimal near the macula, and as it grows more measurable toward the periphery, the visual acuity lowering would tend of itself to prevent marked evidence of peripheral diplopia.

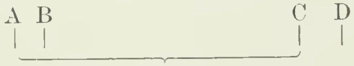
But, as Brodhun remarks, we allow the visual regard to sweep over the entire surface from one point to another.

The nearer the object approaches the eye the less, usually, is the attention directed to the peripheral impression; this follows since the primary object of near vision is exactness, and the detail obtained by enlarging the object. We have the capacity, however, of applying our vision to the minutest portion of an object, or to the whole object, according to our volition; that is, suppression of peripheral images at will through the medium of attention. distraction, as shown by Janet in other connections, being a transitory anesthesia. Further than this there is such a phenomenon as mental suppression of sections of peripheral images. Thus, in reading, we comprehend words of many letters several lines deep in length, to the exclusion of words in the lines above or beneath; in adding we mentally suppress the figures laterally placed.

This power of suppression must be apparent to Dr. Savage in his reference to experiment "a" above, *i. e.*, as regards the vertical incoincidence, which must be suppressed. The points of a flat surface outside of the fixation point cannot lie in the horopter, such a surface being tangent to the horopter circle. They approximate coincidence more as the fixation point recedes, the circle increasing in size, and less as it approaches the eyes, the diameter of the circle diminishing; so that peripheral disconsonance is greater the nearer the vision.

The main significance of the horopter is that relief of objects lying therein is seen with greatest acuteness, and that it is only in that portion of the horopter lying near the fixation point is of importance, is proven by Helmholtz's experiments. Take a pin bent 5° or 10° and hold it before a dark background, on which is a mark for fixation. Holding the pin horizontally, the angle toward you, and passing it into the fixation point the angle is distinguishable, but directly upon passing without the fixation point it can no longer be discerned.

Now, there is little doubt but that peripheral diplopia, when not serviceable for other purposes, could be corrected by fusion independent of rotation. For instance, one observer was found in experiments made by Volkmann with the haploscope, who was able to fuse disparate images of vertical lines situated 4.7 mm. apart, the view point being an equivalent of 1.50 mm. distant



Inter pupillary distance.

The left eye fixing upon A the right upon C—the two being separated by a distance equal to the inter pupillary measurement—A and C thus fall upon the maculæ, while B and D upon disparate points; the latter sufferfusion.* Since this ability is found to vary between individuals, and especially with practice, it is reasonable to expect that in degrees of disparity greater than this fusion could be made to occur from the constant requirement of clear vision from birth up. In these experiments it was found that vertical lines fuse much more readily than horizontal. The above observer could fuse horizontally placed lines only through 0.61 mm. Helmholtz claimed this variation was due to the difference between the vertical and horizontal distances upon the two retinæ, being less in the former. Brodhun suggests that if the eyes were vertically placed instead of laterally, the horizontal would be easier. May it not be due in part to the fact that we pay more attention to vertical than to horizontal lines?

Now, within the distance of the macula proven to be of value for clear vision, for all ordinary degrees of oblique astigmatism, the disparity would hardly be greater than it has been proven possible to fuse; this, taken with the fact that fusion is a function capable of training; the visual regard sweeping over the field to form a judgment; the acuity of vision in the periphery lowering with recession from the macula; and the facts showing peripheral suppression to be physiological; these things should tend to modify the statement of Dr. Savage that only by complete monocular suppression of the image or by rotation can diplopia be prevented.

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*Brodhun, American Text Book of Ophth.. Vol. I.

As to so-called cyclophoria it would seem that since all muscle errors must arise either by malformation or abnormal functionings, both would be as apt to affect the obliques as the recti, according to their relative development, uses and abuses. I think statistics are wanting, however, as to this cyclophoria (*i. e.*, as shown by the double prism test), existing relatively more often in the eyes presenting oblique astigmatism than in those free from it, nor would such evidence be conclusive, for it could still be argued that the causes acting to produce such astigmatism would be most apt to be productive also of abnormal length or insertion of the muscles, and not that the insufficiency is due to the excessive strain to which they have been put in their "harmonious symmetrical action."

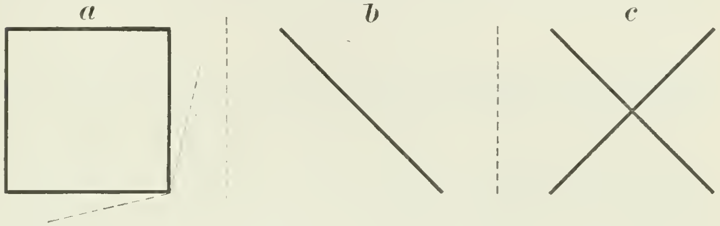
Is it not possible, however, that Dr. Savage has hit upon a truth, howbeit he may have erred in its interpretation?

It is to be noted that rotation, if it does occur as a compensatory measure in these cases, occurs for quite a different object and would vary:

First. As concerns monocular vision, according to the relation of the axis of the astigmatism to the long axis of the object; for instance, monocular vision of a line inclined to the 45° axis (b) would be clearest with an astigmatism at 135°, while an astigmatism at 90° would require rotation toward 135° to improve the vision of such a line.

Second In binoular fixation, according to what would produce the clearest vision of the fused images, *e. g.*, would differ as between the letter R and the letter V, the letter B and the letter A and an X (c) made by lines at 45° and 135° is clearest when the axes are at right angles, respectively, and most blurred when the astigmatism is at 90° or 180°. So that the question would be one of compensatory rotation to improve binocular vision, but would not always be best subserved by coincident placing of images in any form of astigmatism.

I believe the clinical evidence is that oblique astigmatism is more troublesome than vertical or horizontal, that rotation does sometimes occur in these cases, and that cyclophoria is in reality entitled to consideration. It does not seem, however, that it is necessary to go further than that rotation takes place because it improves vision, and that that is entirely relative to the major or most important axis of the object of fixation; and it is only because vertical and horizontal lines predominate in nature—at least in our conception—that rotation toward those meridians is the rule. And this is a point of some importance.*



Harmonious symmetrical action would be required, therefore, only where the object is made up of laterally placed, though symmetrical lines or curves.

How much of a part the obliques play in this rotation must remain in question.

The grouping of these observations may clear up some doubtful points and correct some errors of deduction.

The subject is of more importance than the profession have allowed, doubtless because made prominent by false premises.

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*The reader may easily verify these statements by placing a high cylinder before his normally refracting eye and fixing upon common objects about the room: when it is horizontally placed he will see most clearly—except for strictly horizontal lines—when oblique least so, but if with the axis at the maximum obliquity he tilts his head so as to rotate the cylinder to the horizontal, his vision will be much improved.

A FEW INTERESTING EYE CASES.

By G. Griffin Lewis, M. D.,

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Paralysis of the Superior Minor Branch of the Motor Oculi Nerve Cured by Michel's Method of Passive Motion.

Case I. Master H. W. H., age 13, first consulted me on November 17th, 1896, complaining of diplopia and a slight aching pain in the left eye whenever looking at anything above the horizontal plane.

There was just a perceptible tendency toward a drooping of the left upper lid, and the patient carried his head somewhat thrown back in order to prevent diplopia.

These symptoms were first noticed on the previous morning upon arising, and were attributed by the patient to excessive use of the eyes, as on the night before he had studied unusually late with the lamp directly in front of him, and had experienced considerable fatigue of the eyes.

Careful inquiries elicited no history of hereditary specific disease. Both pupils were of the same size and the pupillary reflex was normal.

In having the patient fix his eyes on my pencil I found the movements of both normal, with the exception of an inability on the part of the left to look up above the horizontal plane. With the candle test he had single vision below and immediately in front, but doubling took place as the candle was raised above the horizontal plane, the false image appearing directly above the real one, showing that the paralysis, which produced the diplopia, was confined to the superior rectus of the left eye. As none of the other muscles, which are supplied by the third nerve, were interfered with in their action, I knew that the trouble must be confined to the superior minor branch of the motor oculi, which alone supplies the superior rectus and the levator palpebræ.

I corrected the refractive error under atropin, giving him a — 0.50 C Ax. 135° before the right eye, and — 0.50 C Ax. 45° before the left. I also prescribed potassium iodide, strychnia and galvanism, at the same time directing the patient to rest the eyes as much as possible.

One week later, on Nov. 24, as he showed no signs of improvement, I made an examination of his urine and to my astonishment found it fully one-third solid albumin.

The test was repeated several times with the same specimen, using both the boiling and the nitric acid, with the same result each time.

Repeated examinations of the urine have since been made, both by myself and his family physician, using morning, noon and evening specimens, but not a trace of albumin has been found.

On December 5th, after eighteen days' treatment, there were still no signs of improvement and, as a last resort, I adapted what is known as the Michel method of passive motion.

After thoroughly cocainizing the eye, I seized the superior rectus muscle at its scleral attachment with a pair of fixation forceps, and alternately moved the eye directly upward and downward as far as possible in the direction of the line of contraction and relaxation of the affected muscle,

I repeated this maneuver for two or three minutes or so each day, directing the patient to apply cold applications for five or ten minutes after each sitting, and occasionally instil a boric acid solution to prevent too much conjunctival irritation.

With this treatment the eye began to improve rapidly, and within two weeks the patient could turn it upward at an angle of about 40° without seeing double, and although he is unable to rotate it upward as far as the other eye, it practically gives him no trouble.

It might be of some interest to state that at about the same time that this muscular trouble became manifest the patient began to develop an enlargement of the thyroid gland.

A Piece of Nail-Head Imbedded Between the Conjunctiva and the Sclera 8 Years Without Producing Trouble.

Case II. Mr. I. C., age 46, carpenter by trade, presented himself at my office with a highly inflamed spot, resembling in many respects a small boil, on the ocular conjunctiva of the right eye about 1 mm. from the limbus of the cornea.

He gave the following history: Eight years previous, while driving a nail, a piece of the head flew off and struck him in the right eye.

He experienced considerable pain at the time, but as upon applying hot applications the eye became quite comfortable and the vision was not interfered with, he did not deem it advisable to consult a physician.

The eye healed up within a few days and gave him no further trouble until eight years afterward, when he presented himself to me, having experienced considerable pain for the past forty-eight hours.

After thoroughly cocainizing the eye, I began exploring the parts with the spud, when to my great astonishment out rolled a small foreign substance, which, upon examination, proved to be the piece of nail-head. After thoroughly curetting the parts, I prescribed an antiseptic wash, and in a few days the eye was entirely healed.

The peculiar features about this case were, first, that a foreign substance of this nature could remain so long between the conjunctiva and the sclera, and in the region of the ciliary body, without creating any symptoms which would remind the patient of its presence; and even taking into consideration the fact that the reaction of the injury may have resulted to a certain extent in adhesions of the conjunctiva and sclera around the foreign substance, is it not a wonder that the almost constant movement of the eye for eight years, during waking hours, did not sooner result in its migration?

A Piece of Gun Cap, which Passed Through the Periphery of the Iris and Lens, and Remained within the Eye 18 Years Without Producing Sympathetic Trouble.

Case III.—Mr. W. H. B., age 32, was struck in the right eye twenty years ago with a piece of gun cap, which his physician at the time was unable to find, and consequently concluded that it had not entered the eye. Following the injury the eye was somewhat inflamed, and the patient had considerable pain through the eyeball, but the sight was not materially interfered with until six years later, when he experienced considerable pain of a neuralgic nature through the right temple, and the vision was samewhat blurred.

These inflammatory symptoms soon subsided, and did not occur again until about two years ago, when the eye once more became inflamed, was quite tender to the touch and watered profusely. This time the symptoms did not totally subside, but were more or less intermittent.

I saw him for the first time on August 24th, 1896, when he gave me the above history, and stated that he was then suffering intense pain through the eyeball and the entire right side of his head. Examination at that time showed a slight opacity of the cornea a little to the inner side of the pupillary margin, due no doubt to the cicatricial contraction of the wound through which the foreign body entered; the lens was cataractous and somewhat broken up, the iris was adhered posteriorly to the lens capsule, the tension was below normal and in the anterior chamber, apparently attached to the posterior surface of the cornea, was a white substance about 4 mm. long, 2 mm. wide and 1 mm. thick. There was an irido-cyclitis, and the eye was extremely tender on pressure.

As there was already some lachrymation and photophobia of the left eye, sympathetic symptoms, I advised immediate enucleation, and on August 27th, the operation was performed.

It was semewhat prolonged by the profuse hemorrhage and the adhesions of the conjunctiva to the sclera, a result of the intense inflammatory process, but the patient rallied, with scarcely any reaction, and on the fourth day left the hospital.

The peculiar feature in this case was the presence of the foreign body in the anterior chamber just behind the cornea. How did it get there? The patient informed me that he first noticed it about two or three months previous, and his statement is, in all probability correct, for it was so conspicuous that had it been there since the injury it could not have escaped the notice of any of the physicians whom he had consulted.

The cataractous lens and the posterior adhesions of the iris to the lens capsule, immediately behind the corneal opacity, were pretty strong evidences of the foreign body having wounded the iris and the lens, but where, during the space of eighteen years or more, could it have been without being visible to the eye or producing sympathetic trouble?

A CASE OF CAVERNOUS ANGIOMA (VASCULAR NÆVUS) OF THE TUNICA CONJUNCTIVA.

By H. O. Reik, M. D.

BALTIMORE, MD.

(Illustrated.)

James Minor, colored, age 16 years, came to the Baltimore Eye, Ear and Throat Hospital, March 1, 1897, for treatment of a growth on his left eye. His mother states that very shortly after birth a small, red, raised spot, probably twice as large as a pinhead, was noticed on his left eye. This statement is confirmed by the midwife; there was no physician in attendance. For some time no change was noticed in the eye, but by the end of his first year, the spot had increased some in size, and for the next five years continued to grow steadily, though not rapidly. It never seemed to give any pain, nor did the tissue immediately surrounding it become inflamed at any time, so it was not considered necessary to consult a physician. The growth assumed its present size by the time he was 6 years old, and since then, his mother thinks, it has undergone little or no change. He consulted me simply because he desired, if possible, to have his appearance improved.

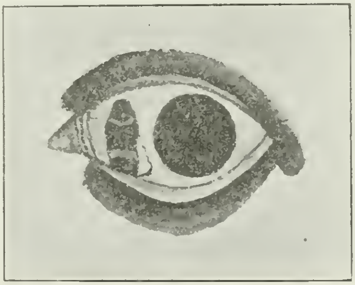

Fig. 1. Appearance before operation.

The tumor was quite noticeable, even at some distance, but on close inspection, with the eye turned outward so that the cornea almost reached the outer canthus, an appearance like that seen in the accompanying water color, was obtained. (Fig. 1.) To the nasal side, and about 3 millimeters removed from the cornea, was a dark, purplish-red tumor, about 15 mm. long, 3 to 5 mm. wide, and 5 mm. in thickness, narrowed somewhat toward its upper extremity, which was rounded, and extending below under the lid into the conjunctiva fornicis inferior. Its anterior surface was convex, smooth and shiny, covered by conjunctiva, and two narrow, light bands of connective tissue appear to pass almost horizontally across the tumor, thus producing a slightly lobulated appearance. Its posterior surface was slightly concave and rested in its entire length upon the bulbus oculi. The tumor was situated entirely in the tunica conjunctiva bulbi, and one or two good sized vessels passed from it below into the conjunctiva fornicis, after pursuing a somewhat tortuous course. By pressure the tumor could be moved very slightly from side to side, but sufficiently to indicate that it was not adherent to the sclera. The plica semilunaris conjunctivæ was hypertrophied, slightly congested and, when the eye was rotated inward, presented several delicate folds.

An incision was made in the conjunctiva near the outer edge of the growth, blunt pointed scissors were then passed beneath the tumor, and it was easily lifted off its bed. No hemorrhage was encountered until the base was cut well down in the conjunctiva fornicis, and even then the bleeding was slight.

I saw the patient last on March 28. The wound was perfectly healed and the eye looked normal, save that the vessels mentioned before as connected with the tumor, were still present, though greatly reduced in size.

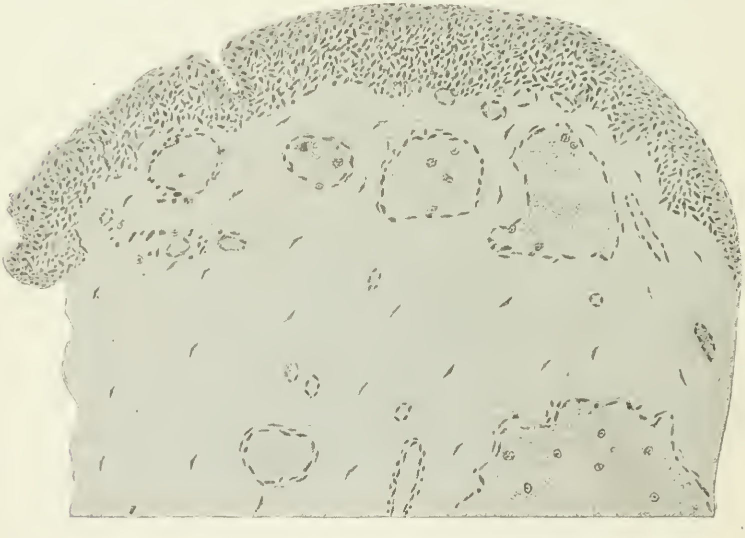

Fig. 2. Cross-section of anterior portion of tumor.

The specimen was hardened in formalin and imbedded in celloiden. Sections were cut in different directions through the growth and stained in hæmatoxylin and eosin, picro-carmine, methylene-blue and lithium-carmine.

Under the low power the tissue seemed to be composed of a loose connective tissue, with many small areolar spaces, and to contain very numerous blood vessels. These vessels run in every direction, and within a small radius one sees various sections of them, taken in their long axis, obliquely or crosswise. In addition, in the most vascular parts of the tumor, large blood spaces are to be made out with tolerably thin walls of connective tissue, walls which in places appear to be lined by endothelium, though this is not easily made out everywhere. These cavernous spaces show thin connective tissue bands running across them, lined by endothelium, and one can think of their being partial or complete partitions, separating adjacent thin-walled sinuses.

By the higher power, the connective tissue is seen to consist mainly of the white fibrous variety, loosely constructed, and not very rich in connective tissue corpuscles. The anterior surface of the periphery of the growth is covered by conjunctival epithelium, below which is a narrow band-like area of round cell infiltration. The endothelial cells lining the numerous small vessels are easily distinguished, and the lumena of the vessels are filled with blood. The relative proportions of the different varieties of leucocytes, so far as could be judged, were not abnormal. (Fig. 2.) The tumor is then, histologically, a cavernous angioma, or it may be called, if preferred, a vascular nævus.

A careful search of literature for any similar cases which might have been reported, has served to show us how very rare they are. As the distinction between angioma and vascular nævus is not a very clear one, and depends apparently upon the question as to whether the tumor is actively growing, or is remaining stationary, it occurred to me that various writers might have made different classification, so I looked not only for reports of angioma, but vascular nævi and telangiectasien, as well. I was scarcely willing to believe that these growths were so extremely rare as this search would make it appear. So far as I am aware, only one case has heretofore been reported in this country. that of Lippincott, and I have been able to find only two others in the English language, both by Dr. Simeon Snell, of London. One of Snell's reports is accompanied by a colored plate, and the shape, size and position of the tumor, give it a strong resemblance to my own. No microscopical examination of either of his cases is mentioned, Lippincott's specimen was examined by Prof. Whitney, of Harvard, and is described as cavernous angioma (1). Rampoldi and Stefanini (2), Armaignac (3), Dubois (4), Talko (5), Van Ammon and Blessig (6), have each described or mentioned one or two cases. Bossalino and Hallaner (7), Reich (8), and Kroschinski (9), have each reported a single case accompanied by histological reports, and their findings are essentially similar to those described in the present case.

Fuchs, in his treatise on diseases of the eye, says: "Angioma of the conjunctiva are of rare occurrence. They are, as a rule, congenital, and increase in size after birth."

Noyes says that, "angioma of the conjunctiva sometimes occurs. Its most frequent seat is the caruncle." Neither of these authors mention nævi of the tunica conjunctiva bulbi.

"Angioma of the conjunctiva," says Saemisch, "either spread there from a palpebral tumor, or develope primarily in that membrane. They are mostly congenital, and occur, as a rule, in the neighborhood of the inner commissure, or exactly on the plica semi-lunaris conjunctiva." He advises their removal, "because after remaining unchanged for some years, they gradually increase in circumference and through narrowing of the conjunctival sac, and later by projection from the palpebral fissure, become quite troublesome."

These tumors, developing primarily in the conjunctiva, according to Virchow, "Are very rare, and seldom progress beyond the nævus stage, although an occasional observation of more extensive growth is known."

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ON PROFUSE INTRA-OCULAR HEMORRHAGE.

By J. da Gama Pinto,

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[Illustrated.]

[Translated by Casey A. Wood, of Chicago.]

In the year 1884 I reported (1) two instances of severe bleeding after cataract extraction, since which time other observers have published similar cases. Among these might be mentioned Simi (2), Fage (3), Van Duyse (4), Noyes (5).

I have myself also observed two additional cases, which I am now able to present, with a report of the anatomical conditions of eyes lost as a result of this complication.

The following is a brief abstract of my previously published cases:

I.—Mrs. B., 57 years old, with myopia of about 10D., has an unripe, slowly developing, nuclear cataract. Extraction, left eye, under chloroform with a small upward corneal flap and iridectomy, slight vitreous loss, but wound edges in good apposition. Bandage. Twelve hours afterward, in the night, severe vomiting and pain in the eye. The bandage was found to be soaked with bright red blood, which also oozed from between the lids. In spite of applications of ice and sub-cutaneous injections of morphia, the bleeding continued; swelling of the lids and chemosis; cornea clear; no anterior chamber. On the sixteenth day after the operation, purulent infection of the eye set in.

Warned by this unfortunate experience, the greatest care was exercised in dealing with the cataract in the second eye. A preliminary iridectomy, with Förster's method, was resorted to and extraction of the lens was not attempted until a year after the initial operation. In spite of this, a smart hemorrhage followed excision of the iris, filling the anterior chamber with blood. The incision was made entirely within the cornea so as to avoid the vessels at the limbus. Healing was normal, and the visual result good.

II.—Woman, 59 years old, very corpulent and full-blooded. Nearly ripe cataract left: right eye, slightly cloudy lens and myopia 3 D. Patient otherwise healthy and with normal eyes. Left lens extracted under chloroform, with a small corneal flap and upward iridectomy. Nothing worthy of note occurred during the operation but three hours afterward vomiting set in, with pain in the eye. Bandage found soaked with fresh blood, which continued to ooze from between the lids. Ice applications relieved the pain, but the bleeding continued, although it was less profuse than before. On the seventh day a brownish blood-clot protruded between the lips of the wound. This was found under the microscope to be made up of a mixture of vitreous, blood and pigment. Finally, the acute symptoms disappeared, and the eyeball atrophied.

Of the 711 cataract extractions done by me in Lisbon, 3 were undoubted instances of serious hemorrhage. I have had another case, not quite so typical.

III.—Man, age 60. Right, uncomplicated, ripe cataract. Left, beginning lenticular opacities: $V = {}^{4}/_{18}$. No vascular changes worth speaking of. Urine normal. Extraction, right, July 9, '92, with iridectomy and under cocain. Small flap incision upward; lens removed without difficulty; some vitreous protruded and was snipped off. Bandage. In the evening patient complained of pain, for which a morphia injection was given. The pain continued until the the second day, when blood was noticed on the bandage. A vitreous mass lay between the lid edges. This was cut off close to the wound. Again on the third day, more vitreous humor mixed with blood escaped from the open wound. On July 22, increasing chemosis. Cornea clear. Through the gaping corneal wound there protruded a clot, composed of vitreous and coagulated blood. Under cocain this was abscised, the parts cleaned, and the edges brought together. A month after the operation the wound had closed, the cornea was clear and the anterior chamber had reformed. In the pupillary area, in the background, one could observe a dark membraneous mass. A month later still the eyeball was atrophic, red and tender.

IV.—Woman, aged 52. General health good. Urine normal. Right, hypermature, light-gray cataract. Iris reacts normally but bulges as in Morgagnian cataract. Projection on the nasal side somewhat doubtful. Left, swollen cataract. Projection good. November 16, '92, extraction, left, under cocain, with a small corneal flap and iridectomy upward. Hardly had the capsule been opened when, without any movement on the part of the patient and although the lid elevator was held by an assistant, the lens and, immediately following it, some vitreous were forced out. The patient was chloroformed at once, the vitreous was snipped off, the edges of the wound were carefully placed in position and a bandage applied. During the night there was considerable pain, and the next day a soft, pigmented mass filled the wound. The pain continued and additional blood and vitreous escaped through the corneal incision. On the 28th of December, the eye was soft, the wound had cicatrized and the pupil was displaced upward. The over-ripe nuclear cataract in the right eye was now removed under chloroform. Although the cortical substance was removed with difficulty and some vitreous was lost through rupture of the hyaloid membrane recovery from the operation was rapid and, after discission, $V = {}^{1}/_{4}$.

V.—This case, although not one of senile cataract, has a direct bearing upon the subject of intra-ocular hemorroage. Man, 35 years of age, admitted April, 1894. Vision, always poor, worse since preceding summer. Iridodonesis on both sides. Lenses dislocated backward and downward. V R = finger-counting at a few inches; V L = fingers at 1 meter. Field of vision normal. Urine normal, and general condition good. The right lens was extracted under chloroform and with irridectomy. The dislocated lens was removed with Weber's loop. Recovery rapid, and the healing of the wound took place without any sign of irritation. Two weeks afterward the eye was white and the pupil clear, but some vitreous opacities were discovered. There was a rather large posterior staphyloma with a deep excavation of the disc, probably due to glaucoma. V. the same as before the operation. Two years afterward patient returned, asking to be operated upon in his now completely blind left eye. On examination, the right eye had V = hand movements eccentrically. Total glaucoma. The cataract in the left eye being mature, and the projection good, I removed the lens in its capsule, August 15, '96. Iridectomy was done, and chloroform was given; slight loss of vitreous. Shortly afterward the patient was attacked by a severe fit of coughing, followed by pains in the eye. The bandage was found to be soaked with blood; the corneal wound was gaping and a mass of bloody vitreous presented in it. The hemorrhage continued for several days accompanied by severe pains, that were relieved by repeated injections of morphia. September 1. The eye is white, but a large black mass protrudes from the lips of the wound. Cornea irregular, but its inferior half is transparent. The anterior chamber has reformed. The protruding mass was snipped off under cocain. This procedure was followed by slight bleeding, but the wound eventually healed and the bulb slowly atrophied.

VI.—Woman, 65 years old, very fat. Left, hypermature cataract with opaque capsule. Tension normal, pupillary reaction and projection good. On the right side there is also cataract, not yet ripe. V R = finger counting. Urine normal. Vascular system in fair condition. June the 9th, '94, extraction of the left cataract with iridectomy and under chloroform. The shrunken lens was removed in its capsule with a slight loss of vitreous. Severe vomiting. On the third day a slight swelling of the lids and scleral conjunctiva was noticed. Cornea clear, but there is a yellowish reflex from the vitreous. Suspecting a beginning infection, the wound was reopened twice and the aqueous allowed to escape. Sub-conjunctival injection of sublimate. The swelling declined during the next few days; the cornea remained clear and the mass in the vitreous looked more like a detachment of the retina. The eyeball gradually shrank, but remained for a long time red and painful. On the 18th of July, the right cataract was successfully removed and V = $^1/_3$ with + 12 D.

This case should not properly be classod with the other five although, on the other hand, tho detached retina was almost certainly pushed forward by a hemorrhage occurring behind it.

We have so far not succeeded in obtaining a demonstration, either clinical or anatomical, of the exact cause of this serious complication. In my former article I expressed the belief that the bleeding arose in consequence of pressure upon the blood vessels, incited by the efforts at vomiting in an eye predisposed by vascular disease to this calamity. For example, if an abnormal weakness of the choroidal vessels were present and a congestion of the large veins were induced by vomiting, a rupture of the former might easily result.

I was the more inclined to accept this explanation because in my two first cases the bleeding set in immediately after the chloroform — vomiting. It was so in Warolmont's case (6). In Simi's (7) case it is not stated whether chloroform had been administered or not, although the hemorrhage set in during the night, after an attack of vomiting. Van Duyse (8) mentions vomiting in the history which he gives, but the bleeding followed immediately upon the occurrence of pain. In my cases, V. and VI., vomiting and, what amounts to the same thing so far as vascular congestion is concerned, severe coughing were probably responsible for the bleeding.

In considering the etiology of intra-ocular bleeding the refractive condition must not be forgotten. My first two cases were myopic, one of them of high degree (10 D.); number V. belongs to the same class. O. Becker (9) and Van Duyse mention each one case, and Noyes two more examples of myopia. It is well known that myopia, especially in old people, predisposes to choroidal bleeding. It is not surprising if, after cataract extraction (the support afforded to the walls of the blood vessels being removed and the eye-coats being also allowed a certain amount of movement upon each other) a rupture of the vessels of the choroid should occur. Noyes appears to take this view of the case, as he warns the operator against the dangers of cataract extraction in old people with high degrees of myopia.

Not only is this matter of great importance from a theoretical standpoint, but it is also of practical value in considering the question as to how we shall avoid such a serious complication. Noyes advises a preliminary iridectomy and in his fourth case followed this plan in the second eye with good results. In my own case (No. 1) I had a similar experience, although I am inclined to doubt whether the initial operation did more than avoid the difficulty arising from the iridic bleeding, thus giving a clear field for the extraction and the manipulations that preceded and followed it. That a preparatory excision of a portion of iris does not afford an absolute protection against a disastrous result from intra-ocular hemorrhage, is illustrated in a case reported by Van Duyse—a woman, aged 67, with slight plus tension and cataract in both eyes. Eserin was prescribed and iridectomy done in both eyes. Later, a double cataract extraction in one sitting. Immediately afterward, profuse bleeding occurred from one eye, which was eventually lost.

Myopia alone cannot be held responsible for this accident; other factors must be considered. Chief among these are the age of the patient and the loss of vitreous during the operation. There was a varying amount of vitreous lost in five of my six cases. Noyes mentions this complication in three of his four cases. Of course we must exclude from these the instances where the escape of vitreous was not the cause, but the consequence ef the hemorrhage, as in my own cases, III. and IV.

Even a more marked example is that of Becker's case (1). An elderly physician, extremely myopic, had been operated upon for cataract. Immediately after the removal of the lens the vitreous presented in the wound in the shape of a large ball. The hyaloid membrane did not burst and no blood escaped, but the latter could be seen with the naked eye lying behind the protruding vitreous. We can only say, in such cases, that whatever be the cause of the accident, the choroidal vessels burst and the escaping blood forces the vitreous through the corneal wound.

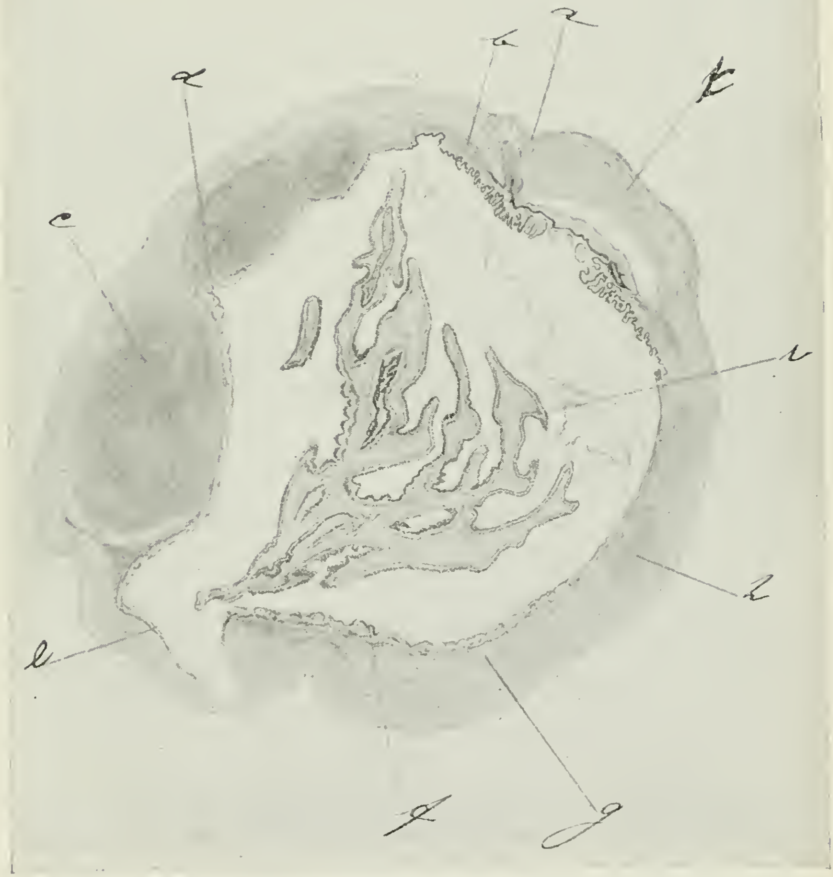
To these predisposing causes one must add an abnormal weakness of the vascular walls. This is commonly considered as a part of a general defect. In my five cases, however, nothing of the kind was found, but in case I there were many signs of the hemorrhagic diathesis. The iridectomy was followed by profuse bleeding while slight taps with the fingers on the back of the patient's hand produced large blebs of blood. In Arlt's case (1) there was a flat nævus on the corresponding side of the face and it may be that a varix of the choroidal vessels existed. Simi mentions the existence of atheroma of the radial artery. Van Duyse mentions another case presenting cardiac hypertrophy, general arterio-sclerosis and the formation of varices.

The nature of these changes in the choroidal vascular system has been fairly well determined by histological examinations but, until recently, nothing definite has resulted from them. Van Duyse, who was the first to examine an eye lost from intra-ocular bleeding, found the choroid detached from the anterior and upper part of the eyeball. The ciliary body was torn away from its normal position and the whole iris pressed into the wound. The vessels of the uveal tract were filled with blood but their walls were entirely normal. There was nothing abnormal about the retinal vessels. The next examination was made by Fage in Badal's clinic in Bordeaux. The eye had been enucleated twelve days after a cataract extraction done under cocain. The general ocular system was normal, Soon after the removal of the lens a burning pain was felt in the eye, profuse hemorrhage set in, finally ending in panophthalmitis. On opening the bulb blood was found between sclera and choroid. Ciliary body and retina were detached. The microscope showed the blood vessels and tissues of the choroid to be absolutely normal. The retinal sections were not well defined; still, the source of the bleeding was thought to be in the choroid.

I have also had an opportunity of making a similar histological examination. The eye was removed from a patient operated upon for cataract extraction by a colleague. The extraction was successfully made but was followed by profuse bleeding and final atrophy of the globe. The eyeball was hardened in Müller's fluid and alcohol, stained with hematoxylin and alum-carmine and imbedded in celloidin.

Fig. 1 (see Plate) shows a cross-section of the globe, enlarged four times. The section is somewhat peripheral but shows very plainly the characteristic changes. The wavy border plainly indicates the general shrinking. The extraction wound (a) is sharply retracted, infiltrated throughout, and holds the incarcerated iris. The lamellæ of the swollen ciliary body (b), close by, near the top of its free margin, as well as in the neighboring choroid are infiltrated with blood. Farther backward is a large blood collection, divided into three distinct parts (c). With a stronger lens it is noticed that in this situation the choroid is split, the thicker layer forming the inner border of the blood clot (d). The thinner layer lies against the sclera, disorganized and infiltrated with blood. In this locality also are scattered both pigmented and non-pigmented cells, as well as free pigment. Still farther behind, the choroid, although infiltrated with blood, is undisturbed throughout its whole thickness and is attached to the sclera (e). In the other half the conditions are the

Fig. I.



Vertical section of an eye operated on for cataract and lost from choroidal hemorrhage.

same, although the bleeding has a more interstitial character; the choroid is also split into two layers, the thicker of which is detached (f), the other being divided into sections filled with blood (g). At *h*, in the middle of the diffused bleeding, is a circumscribed hemorrhage.

The detached retina (i) lies in many folds, between which sometimes blood, sometimes celloidin masses may be seen. At some points parenchymatous bleeding may be observed in the retina, a hemorrhage whose origin was undoubtedly the retinal vessels themselves.

The most careful examination of the chroidal and retinal vessels showed absolutely no changes in their walls that might explain the bleeding. This examination, as well as that of the two cases already noted, indicate that the bleeding originated in the parenchyma ef the choroid and probably, as a secondary result, from the retinal vessels. The present investigation, therefore, confirms what has already been published.

Intra-ocular hemorrhage following other operations on the eyeball, or as a result of perforation of the cornea in ulcer, is still rarer. Such a case occurring in my own practice is the following:

Mrs. A., aged 63, left eye blind, a year before consulting me, from acute glaucoma. Right eye for some time affected by intermittent attacks of lowered vision. The left eye is very hard and amaurotic; iris atrophic, a. c. shallow, greenish reflex from the pupil; in short, a typical picture of absolute glaucoma. The tension of the right eye is somewhat raised and the disc is slightly excavated. The F. of V. is contracted up and out as well as down and in. Myopia 1 D.; V = $^1/_3$. After use of eserin for three days, V = $^1/_2$. Iridectomy was done, without accident, and with excellent visual results. About six weeks afterward (Dec. 19, 1888,) the patient again came to me with a severe inflammation of the left, blind eye. The cornea showed a central, cloudy ulcer. Hot fomentations were ordered. Dec. 30. There is a little bleeding from the vessels of the ulcer. Next day the cornea was clearer and the edges of the ulcer better defined although its apex now extends to Descemet's membrane. There is intense ciliary injection including the periphery of the cornea; nearer the center a concentric zone of parenchymatous bleeding. Jan. 1, '89. In the night there was a rupture of the cornea followed by profuse hemorrhage. In spite of a pressure bandage bleeding continued until 10 o'clock in the morning, trickling along a clot. about a cm. in length, that protruded from the perforation in the cornea. It was not possible to discover the origin of the hemorrhage—whether from the iris or deeper. Conjunctiva chemotic. The eye was enucleated, the average amount of bleeding followed and wound healed nicely.

Fig. 2 (see Plate) shows a horizontal section of this eye magnified four times. The globe is much enlarged, although the normal form is retained. The nerve is completely excavated (a), its connective tissue degenerated and in consequence full of cells. The excavation in the nerve head, as well as the whole vitreous cavity is filled with blood (b). The detached and wrinkled retina stretches like a thick cord from the papilla almost to the cornea (c); only its nuclear layers are distinguishable. The choroid is also totally detached and adherent to the retina (d); only where the posterior ciliary arteries enter the eyeball has it remained in place and even here a well marked layer of blood separates it from the sclera. It is as if it had been held in place by the vessels themselves in spite of the pressure exerted upon it by the escaping blood. In the anterior part of the section, at its nasal apex, a portion of the choroid is still in place but is split into layers by the blood (f). The ciliary body is here plainly seen (g), although infiltrated by blood. Only a small portion of the cornea is to be seen (h); it is crowded with cells and has running through it numerous fine vessels. In the open perforation-wound is a thick plug, composed of blood-coagulum (i) and choroid. The choroid shows toward the temporal side its entire thickness (d) but on the nasal side it appears only as a thin layer infiltrated with blood (j). In the center of the clot are fibrinous filaments, vitreous shreds, retinal remains, as well as pigmented and colorless cells.

The parts most worthy of notice are, however, the choroidal vessels. These are so decidedly enlarged and their walls so evidently thickened that they, in spite of the slight magnification, can be readily distinguished (k). This thickening of the vascular walls, the unusual increase in the lumen of the vessels and their distension with blood explain the swollen appearance of the choroid. The walls of the vessels are everywhere infiltrated with round cells that have here and there undergone degeneration. A good idea of the changes that have taken place in the walls of the choroidal vessels may be obtained by observing two cross-sections, marked *c*, and situated near the nerve head, behind the detached retina. In the smaller the lumen of the vessel can be readily made out, while that portion of its wall toward the sclera is markedly displaced by the blood clot.

All these vascular changes were undoubtedly due to the

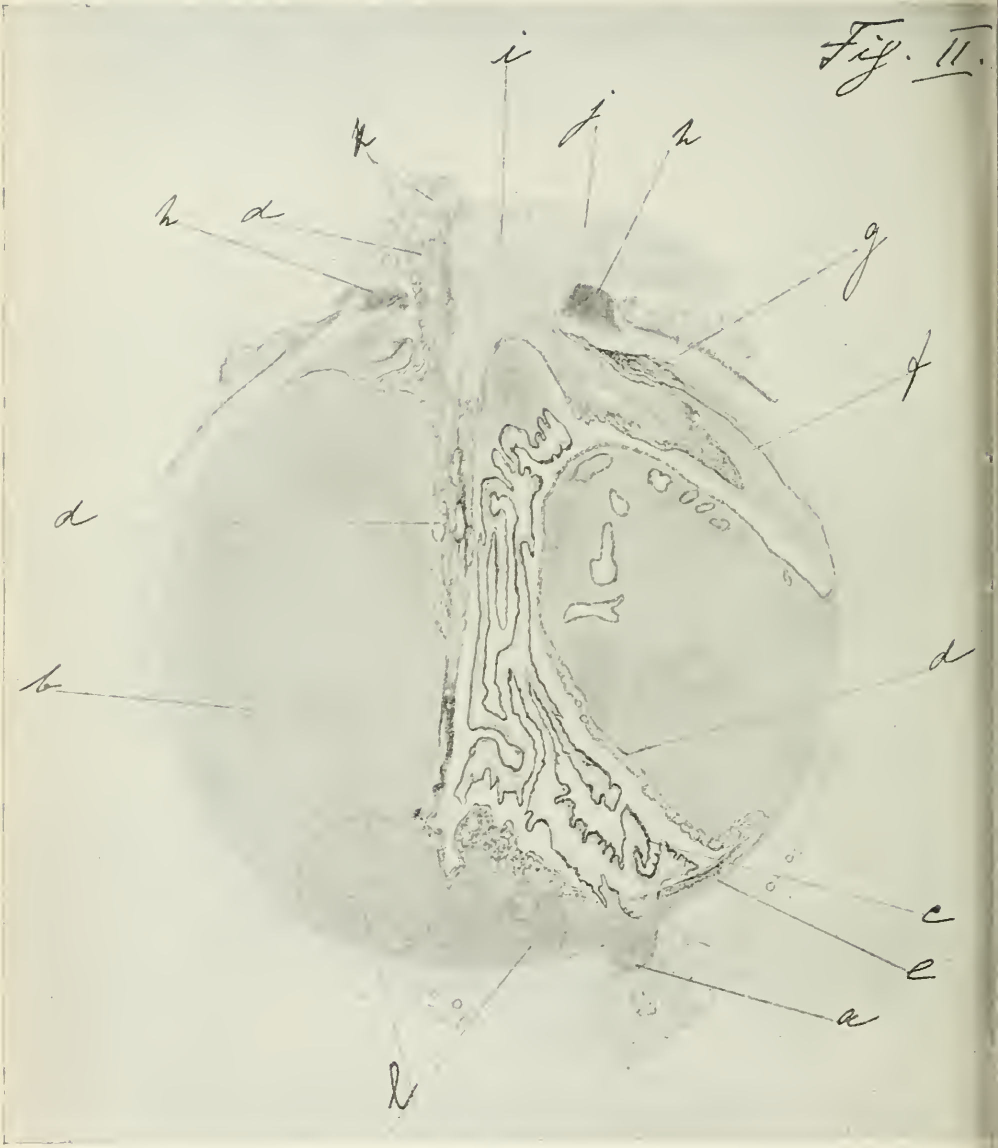


Fig. II.

Horizontal section of a glaucomatous eye with perforating corneal ulcer and intra-ocular hémorrhage.

glaucomatous process; the immediate cause of the hemorrhage being the sudden rupture of the stretched, infiltrated and congested eye-coats containing the previously degenerated choroidal vessels. A similar case is published by Dufour (9) of Lausanne. Iridectomy was done for the relief of pain, on an eye affected with absolute glaucoma. Hemorrhage set in and the eye was immediately enucleated. When examined a large retro-choroidal clot was discovered which had pushed forward both retina and choroid into the lips of the wound.

My thanks are due to Dr. F. Meyer for the two drawings accompanying this article.

A CONTRIBUTION TO THE TREATMENT OF SYPHILITIC AILMENTS OF THE EYEBALL.*

By Jehin Prume, M. D.

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The treatment of syphilitic ailments has always been the subject of constant research and eternal discussions.

This complaint offers such a vast scope for observation, that we can daily verify some of its manifestations.

In fact, of all the ailments which trouble our poor humanity, one of the most universally spread, is syphilis.

After all, what is syphilis? Is it an infectious ailment? Evidently, since all the clinical observations tend to demonstrate it; an ailment manifesting itself by a series of known phenomena, demonstrated and absolutely typical, invading our economy at first by degrees, to smite sooner or later, without distinction, its slightest elements. It is at first a purely local and characteristic affection, which disappears, to furnish later on desperate, and yet nearly always lasting symptoms.

Indeed, what so singular and irregular, as the different periods of this disease. Today you attend an individual who has a chancre of the genitals; he comes back to you a few weeks, or months later, with an eruption of the teguments, an affection of the mouth, loss of hair, and yet all this has the same course. A few years later the patient may have either an affection of the nose, the liver, the eyes, and what not; it is always syphilis.

Therefore, it is what Dr. Lancereaux, in his masterly clinics, would repeat to us over and over again:

"A doctor must always be on his guard; in any sick person, one must always suspect syphilis, hysteria or alcoholism. These ailments, at times show very strange symptoms which may, if we are not on our guard, lead us to giving a diagnosis altogether different from the real one."

How many doctors who, after having treated the first syphilitic manifestations, chancres, mucous blotches, etc., believe their patients are forever rid of the germs of the disease? Yet, ten years, fifteen years, twenty years after, the syphilitic may again be compelled to consult his physician.

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* Read before the Ophthalmological Society, British Medical Association, Montreal, September 2, 1897.

Give mercury or iodide of potassium to this patient, and you will see him if not entirely recovering, at least improving. Syphilis has not left this patient; it was simply dormant, and it appears again suddenly, more terrible than ever, and when least expected. Even twenty years after the initial lesion.

Syphilis is then a general ailment with local effects; and for this reason, is of interest to practitioners in every branch of medicine; that is, general pathology, and the different specialties derived therefrom.

In ophthalmology, no more than in the other branches of the medico-surgical science, do we escape the phenomena of the terrible disease.

We have occasion to contend with it, alas, but too frequently, with this double satisfaction: Of being able to recognize the enemy, in the very center of the eyeball; and of possessing the instrument which, sooner or later, will surely drive it out.

Unfortunately, we are often too late, the disease has made too much progress to allow us to repair what has been lost; being unable to completely save the eye, we must be content to preserve a slight remainder of sight, which will help the patient to continue his hard existence.

The remedy which we use against syphilis as is well known, is mercury, and indeed nobody pretends changing this treatment. Of late years, however, serum injections appear to have caused a revolution in the practice of therapeutics.

We read in the *Medical Annual*, (New York, 1897, p. 554,) Norman W. Walker, M. D, Edinburgh:

"There are several papers dealing with the serum treatment of this disease, from the perusal of which it is evident that the method is one of some value.

"Pellizzari (*La clinica Moderna*, Feb. 15, 1896,) reports a case where treatment was commenced on July 5, and by October 10, 1892, all symptoms had disappeared, and the patient remains up to the present perfectly well.

"Pellizzari is satisfied that in every case the manifestations are rendered milder. The best results were obtained when the treatment was begun early. He therefore, believes that it confers a sort of immunity on the tissues.

"Gilbert and Fournier used the serum for a patient in the late stage, and found the results quite satisfactory. They have also tried to get a protective serum from animals inoculated with the disease, and some patients were treated with this serum. The results were not so satisfactory."

Undoubtedly the serum treatment is called upon to play a great part in the future. However, it is impossible for us to consider it seriously as yet, the observations obtained up to this day, although very promising, are not conclusive enough to become positive and absolute rules.

We must, as it is, continue with the old treatment.

Mercury being then the only positive treatment now known, in so far as results are concerned, we have only to study which mode of administration will give us the quickest results.

Mercury has been administered under nearly every form. Gilbert's syrup, proto-iodide, subcutaneous injections, frictions, subconjunctival injections, etc., etc. But there are cases where the digestive organs seem to tire, when the patients refuse to submit to subcutaneous injections, when the subconjunctival injections, although as well made as possible, are so painful that the patients cannot bear them. Frictions, even when regularly administered, give but very uncertain results in certain cases.

Under certain circumstances, a rapid result and immediate effect are urgent. How are we to supply the deficiency of the different methods of absorption of mercury? It is by resorting to new processes. In medicine, everything is obtained by experiments, and it is precisely only after having studied and tested all the different methods of administration of mercury, that we can form an exact idea of the question.

Nevertheless, many doctors are content to administer mercury under one form or another, without even trying other methods, so that some of their patients recover, while others, on the contrary, remain in about the same state.

Why this difference? For the very simple reason that the power of bearing is not the same in everyone; we may have a patient with whom frictions will give marvelous results, whilst with another, results will be absolutely null; still another patient may be unable to take mercury by the gastro-intestinal tract, and lastly, subcutaneous injections may cause numerous abscesses, and the patients may positively object to subconjunctival injections.

What then shall we do—shall we persist in the same treatment? Not at all; we change the treatment; we experiment on the same patient with the different methods, and in this way may obtain good results.

All the different modes of administering mercury have undergone a certain revolution; thus it is, that we have passed from absorption by the digestive conduits to the frictions and fumigations, then to subcutaneous and subconjunctival injections, and lastly, to intra-venous injections.

We were present at the first intra-venous injections practised in Paris. We have operated upon over two thousand, and we believe that we are in a position to explain these therapeutical proceedings with all the advantages and disadvantages they may possess, and give even to the minutest details its operative technic.

What are the real advantages of intra-venous injections over the other methods of administering mercury?

It is by analyzing the disadvantages which the other methods may offer, that we will succeed in answering this question.

If mercury is administered by the digestive conduits, proto-iodide pills, Gilbert's syrup, etc., it sometimes happens that, after a certain time, the treatment must be discontinued on account of the bad condition of the digestive organs; dyspepsia, diarrhea, gastralgia. Fournier says. we even meet with patients whose stomach and intestines show themselves absolutely refractory to mercury and will not tolerate it.

Frictions do not have the disadvantage of fatiguing the digestive organs, they act quickly and surely, but on the other hand, every practitioner knows how hard it is in private practice, to have this treatment accepted; many persons refusing to apply a repulsive and apparently unclean pomatum to their teguments. It is, in truth, only a detail, but still one which must be considered. Moreover, frictions are liable to cause mercurial affections of the skin, and finally, stomatitis.

It is a curious fact to establish that with the intra-venous injections, stomatitis does not, or hardly so exist. Again we repeat it, we have practiced nearly two thousand intra-venous injections, and we have had but two cases of stomatitis, and even then very slight ones.

Subcutaneous injections are practised to a great extent; we have made as many as one hundred in a day. They are sometimes very painful; if they are given in the lumbar parts, the least movement causes pain; in the gluteal parts, other inconveniences, easily appreciated; in the arms, it produces a numbness of the arm and hand. Happily, these phenomena are not regular, but those who have specially treated syphilitic affections, know how troublesome they are to the physician and how painful to the patient.

Moreover, they are liable to produce nodes, which persist and are the source of considerable annoyance and inconvenience to the patient. We have in several cases noticed the formation of abscesses, even when the greatest care had been taken. Sublimate and alcohol lotions, sterilizing the needle by passing it through the flames of an alcohol lamp, collodion dressing. These abscesses usually take very long to heal, mortification of the tissues setting in; they are more frequently met with in lymphatic subjects. We have had two patients in particular, a young girl of 18, and a child of 9, who had all the symptoms of lymphatism.

Subconjunctival injections may be practiced in certain syphilitic affections of the eyeball. A solution of sublimate (bichloride of mercury) in doses of 1 to 1000. Whether these injections are given in massive doses or in a few drops only, they are equally very painful.

We usually proceed in the following manner:

Anesthesia of the eye is obtained with a few drops of cocain (sol. 1 to 20) but immediately the effects of this pass off, the patient suffers excessive pain, which may last two or three hours. Our friend, Dr. Moisonnier, of Pairs, and I, have slightly altered this method by adding a few drops of cocain to the liquid injected. We have obtained rather good results, but must take into consideration, as an after effect, a real idiosyncracy for cocain on the part of the patient.

We are very much in favor of the subconjunctival injections which render every day such great services in ocular therapeutics and which, in the last few years, appear to have been undergoing a very great development. But we believe that they are more liable to do good in the treatment of local infections, affections of the eyes, rather than in an affection caused by the general condition of the system.

Intra-venous injections act very rapidly and if the doses are properly regulated they produce none, or hardly any of the general symptoms. It will be easily understood that if the medicament is sent directly into the circulation the action is more direct, and there being no necessity of administering large doses; these latter are easier to control. They produce no local phenomena unless the injections are accidentally made into the peri-vascular tissues, which sometimes happens when the patient's venous system is badly developed. It is, therefore, preferable to abstain from these injections when treating a person whose superficial veins are not quite visible; for in such a case, the same inconveniences will present themselves, as for subcutaneous injections.

The mercurial salt which we employ for the intra-venous injections is the cyanide of hydrargyrum. It is a very toxical salt, soluble in water, ether or alcohol. This salt of mercury was first used for injections in 1874 by Cullingworth; since then a large number of physicians have used it, amongst others, Abadie, Boer, De Wecker, Darier, De Spevile, Guntz, Galezowski, Mandelbanus, Sigunmd, Panas, etc., etc.

The preparation of cyanide of hydrargyrum for injections requires special care. We will, therefore, enter into certain pharmacological details, which we believe to be indispensable.

We use cyanide of hydrargyrum in doses of 1 to 100, that is to say:

Cyanide of hydrargyrum . . .	1 gram.
Aqua destillata	100 grams.

Mr. Girard, chemist of Paris, ex-assistant in the Paris hospitals, usually prepared the solution for Dr. Abadie's clinic in the following manner:

Take 1 gramme of cyanide of hydrargyrum, dissolved in 100 grammes of aqua destillata which has been boiled, and the whole filtered and placed in a very clean bottle, and then seal with a ground glass stopper.

You are now in possession of a perfectly limpid and sterilized liquid, containing neither germs, dust, or other foreign matter.

Physicians must be very particular concerning the limpidity of the solution prepared.

As for instruments:

A syringe.
A platina iridized needle.
An alcohol lamp.
A flannel bandage.
Hydrophyle cotton-wool.
A solution of alcohol, one-third, or a little ether.
Collodion.

Since it is with the syringe that we are going to inject the liquid into the vein, we require a most complete instrument, one possessing special qualities.

The syringe we usually make use of for subcutaneous injections has a glass pump body, provided with a nickeled steel mounting, and having a steel piston finished with a plug of different composition, either amianth, rubber or cork. These pistons, which render real services in subcutaneous injections, become very dangerous in intra-venous injections. They have the disadvantage of being difficult to sterilize, their different parts being somewhat difficult to take apart. Further, that which is to be specially avoided in an intra-venous injection—foreign bodies liable to cause embolism—are often caused by the amianth pistons which fray, and these scraps of amianth transferred to the circulating current present a constant danger which must be avoided; cork pistons break into small particles, and for this reason offer the same inconveniences. As to the rubber piston syringes, they have a double disadvantage. Firstly, the drying of the rubber often renders the syringe useless for several hours, and secondly, to prevent this inconvenience, the piston must be lubricated with some kind of oil. It is useless to insist on the disinfecting properties of this system.

This instrument has been realized by a Parisian firm, Mr. Wulfing-Lüer, who has put on the market a syringe constructed wholly of glass. This syringe was presented to the Société de Biologie de Paris. by Dr. Malassez, of the Academy of Medicine, and to the Société d'Ophtalmologie, and the Société de Syphilligraphie, by Dr. Charles Abadie,

This syringe, as we have already stated, is entirely of glass, both the body of the pump and piston. It is composed of two pieces only—the body of the pump and piston, which can be separated from each other at will. The piston is so constructed that it slides easily and softly, without causing any loss of the contents, and without allowing air to penetrate within the syringe. As to the sterilization, the instrument can be brought to a temperature of 125 degrees of the autoclave, and this without any risk of breaking it. (Dr. Malassez's experiments.)

We are now in possession of a perfect instrument which, by its transparency, allows us to ascertain whether the liquid we are going to inject contains foreign matter or air bubbles.

There is also the question of needles to study. They are generally made of tempered steel or iridized platinum; we particularly recommend these latter; although more expensive, platinum needles are far more advantageous. Before making any injection, it is important to have the needle well sterilized. This is obtained by passing the needle through the flame of an alcohol lamp. Now heat softens steel needles, which then break easily, (another danger) while this does not happen with platinum needles. At Dr. Abadie's, we made an average of 80 to 100 injections per day, and used but one needle per week. However, we recommend that after a needle has been used, its point be inserted in elder tree pith, which will prevent its getting blunted.

As to the manner of proceeding with the operation, nothing is more simple.

You take a band of flannel (1 meter in length by 3 inches in width) which you bind tightly around your patients arm, in the same manner as if you were going to bleed him. You make him keep his arm in a hanging position and move his fingers so that the veins may get well filled with blood.

The question of the venous system is most important for this treatment. The patient must have very salient, not filiform veins, for it might be unwise to try to inject on a person who does not possess very distinct veins. The reason of this caution, is the danger there would be of injecting the liquid in the peri-vascular tissues and producing nodes, or very painful abscesses. It is preferable in such cases to resort to frictions or subcutaneous injections in the gluteal parts.

As to the choice of the vein, nothing is determined; the most salient or most superficial one is chosen. If the vessel is mobile, it can be steadied with the thumb and index finger of the left hand, while injecting with the right one.

Having placed the bandage and chosen the vessel in which you desire to inject, you wash the part carefully with sublimate (bichloride of mercury at 1 to 2000), and then pass over it a pledget dipped in alcohol or ether.

You take the syringe and passing the needle through the flame of an alcohol lamp, draw into the syringe some of the solution to be injected, you again pass the needle through the flame, and spirt out a few drops of the solution to expel the air which may be within the syringe or needle. This done, you ascertain by looking through the transparency of the syringe, whether it contains dust or air.

After telling your patient to keep his arm in a horizontal position, you pierce the vein lengthwise (so as to avoid piercing it through and through.) When the needle enters the vein a sensation of void is felt, which is caused by the needle entering into the air contained in the vessel after having passed through the different tissues. Before injecting, the bandage must be removed; you push the piston, remove your needle and stop up your little wound with hydrophyled cotton-wool dipped in collodion.

Our operation is concluded if, however, it is worthy of being called an operation—taking only two or three minutes in all.

The patient feels no pain whatever, and as many of them have told me, the most disagreeable time is when the bandage is applied, the compression bringing on a rather painful numbness of the arm and hand.

Doses—The injection is made with a syringe of 1 cubic centimeter capacity. Each cubic centimeter of a solution to the hundredth part contains 1 centigram of the mercurial salt. The solution we use, is the following:

Cyanide of hydrargyrum	1 gr.
Aqua	100 gr.

The dose for an adult is, at the maximum, 1 centigram.

We have treated a lady who, a few hours after a subcutaneous injection, felt such gastro-intestinal pains, vertigo, and vomiting, that she believed herself poisoned. To this person, who is now quite well, we have never been able to administer more than half a syringeful (half a centigram), that is, half the maximum dose.

It would then be prudent to begin by injecting a fourth of the syringe's capacity at first, augmenting the dose progressively up to the power of bearing of the patient. For children, begin by injecting an eighth part of the syringe's capacity, and you can go up to half a centimeter of the solution, that is, half of the syringe's capacity. We have treated a young patient 14 years old, who had sclerous otitis and parenchymatous keratitis; we brought the dose to 1 centigram for this case, but this is a very rare occurrence and even then extreme care must be exercised.

Mercurial treatment, like any other treatment, must be continued a certain time to obtain results. We usually proceed as follows:

First series.—Twenty injections, one every other day; an interval of 20 days.

Second series.—Twenty injections, one every third day; an interval of 20 days.

Third series.—Twenty injections, one every fourth day: an interval of 20 days.

Last series.—One injection per week, as long as the physician deems it advisable.

We have had patients who, after having followed the above treatment, would come back at more or less distant periods for a series of from four to six injections.

After all, what are the objections made against the intra-venous method?

The dangers which may supervene sooner or later:

What are these dangers? Foreign matters; air bubbles.

These two objections can no longer exist when a suitable syringe and a well prepared liquid are used.

Embolism! Thrombosis!

Here are certainly two serious objections, leading to numerous considerations; but medicine being above all, a science of observation, these same observations will prove the right or wrong of the above contentions.

True, we produce a local wound on a vein, which may cause a more or less severe inflammation. But with all the antiseptic precautions taken nowadays, and which we have extensively described, can we hesitate for a moment?

Can we hesitate for a moment to practice a therapeutic treatment which may save a patient, on account of unfounded objections? (Observations are conclusive.)

Again we repeat it, intra-venous injections are not a panacea, but they are certainly called upon to render great services in syphilitic therapeutics. We have already numerous proofs of its efficiency; there remains for us but to pursue our researches on the subject.

The positive advantages of intra-venous injections are: A sure and rapid action, the most significative results on patients with whom all other mercurial treatments had failed. or had been the cause of vexatious troubles.

Dr. Garl. of Munich, who daily practices intra-venous injections of hydrargyri salts, writes in the *Munchener medezin Wochenschrift*, (1895, No. 20, p. 465.)

I. Intra-venous injections are painless.

II. The quantity of mercury injected is minimum, and may be rigorously dosed.

III. The cure of syphilitic manifestations is obtained very rapidly.

IV. The injections are absolutely inoffensive (judging at least by known facts up to the present day.)

V. The treatment is not conspicuous, and does not prevent the patients from pursuing their daily occupations.

It is claimed that intra-venous injections are dangerous.

Dr. M. L. Desguise (*Annales et Bulletins de la Societe des Medecins d'Anvers*, February, 1895,) has obtained excellent results by performing intra-venous injections of sublimate in septico-pyæmia. Out of four condemned patients, he has saved three. None of the injections have caused local or general troubles to the patients.

Dr. Bacelli has extolled the intra-venous injections; he daily practices these injections, and reports having had no accidents to record.

Dr. Charles Abadie has extolled the method in France.

Dr. Kezmarszky has obtained very fine results by practicing intra-venous injections in cases of serious puerperal septicemia. (Injection of sublimate.)

Dr. Dinkler, of Berlin: The rapidity of action of the medicament injected by the intra-venous method, explains itself, when one considers that with this mode of introduction the salt of mercury immediately finds itself in the blood. Further, Dr. Dinkler subscribes to what Dr. Bacelli says, when he attributes one of the principal advantages of the intra-venous treatment to the energical action exercised by the medicinal substance on the parietes of the vessels.

Dr. Darier, of Paris, has never had the least accident with intra-venous injections.

Dr. du Castel, of Paris, physician of St. Louis' Hospital, writes in Vol. VI, of *Traite de Therapeutique applique*, by Professor Albert Robin.

Mercurial intra-venous injections: Professor Guide Bacelli has recommended intra-venous injections of sublimate; Abadie has constituted himself the defender of this method; he has especially noticed its efficiency against affections of the eyes and the nervous system; the mercurial salt used by this learned observer, is cyanide of hydrargyrum, in doses of 1 centigram administered every other day. No accidents have ever happened when all the rules of a rigorous antisepsis have been observed.

Dr. Jullien has practiced numerous intra-venous injections without accident. (Société de Syphilographie de Paris, 1897.)

Dr. Beaudoin affirms that surgeons very frequently wash the blood nowadays by means of intra-venous injections without observing any accidents. (*La Semaine Medicale*, Paris, 1897, No. 22, p. 176.)

Finally, I myself have personally practiced over two thousand intra-venous injections without accident, and with a percentage of 90 to 100 of advantageous results.

Following are a few conclusive cases:

B. H., 33 years. Syphilis in 1882, facial paralysis in 1884, strabismus and ptosis in 1894. After 12 intra-venous injections no more ptosis; after 18, no more strabismus. Other mercurial treatments had failed on this patient. Health perfect.

E. V., 40 years old. Syphilitic irido-choroiditis: vision = $^{1}/_{40}$. After 14 injections, vision = $^{1}/_{6}$.

James T., 30 years old. Vision = $^{1}/_{20}$: syphilitic chorio-retinitis. After 26 injections, vision = $^{1}/_{10}$.

M. G. Chorio-retinitis: vision = $^{1}/_{16}$. Frictions, pills, give no results; 75 sub-conjunctival injections, nothing: 130 subcutaneous injections, nothing. After 24 intra-venous injections, vision = $^{2}/_{3}$. General health perfect.

Mrs. E. C. Double optic neuritis dating back two years: vision = $^{1}/_{5}$. Found it impossible to administer other mercurial treatment to this patient: ulitis, gastro-intestinal troubles. After 60 intra-venous injections, vision = $^{2}/_{3}$. General health perfect.

Miss M. P. Hereditary syphilitic chorio-retinitis. Cannot read. After 16 injections is able to take a position as book-keeper in a store.

Miss E. G., 24 years old. Chorio-retinitis dating four months back: roseola, mucous blotches of the mouth. After 12 injections, no more roseola and mucous blotches. Vision before injections — $^{1}/_{2}$: vision after injections, $^{2}/_{3}$.

M. L. Before treatment, vision R. E. = $^{1}/_{10}$; L. E. = $^{1}/_{18}$. Atrophy of the optic nerve. After 33 injections, vision R. E. = $^{1}/_{16}$; L. E. = $^{1}/_{4}$. The affliction remains and persists at this degree.

M. T., 38 years old. Double atrophy of the optic nerve. Vision — R. E. = counts fingers at 25 cent.: L. E. = $^{1}/_{6}$ at 5 meters. After 10 injections, vision R. E. — counts fingers at 1 meter: L. E. — $^{1}/_{4}$.

E. B., 16 years old. Paralysis of the third pair. Hereditary syphilis. Other treatments gave no results. After 33 injections no more ptosis nor strabism. Progressing favorably for two years.

J. G., 51 years of age. Syphilitic since the age of 35. Double atrophy of the optic nerves. Vision R. E. — $^{1}/_{20}$; L. E. — $^{1}/_{20}$. After 6 injections, vision R. E. = $^{1}/_{10}$: vision L. E. $^{1}/_{10}$.

From personal observations we conclude that: (1) Intra-venous injections should be practiced only in serious syphilitic cases, when immediate results are required, (2) when other mercurial treatments have given no results or very slight ones and, (3) when other methods of administering mercury are not accepted by patients.

THE VALUE OF REPEATED AND DIFFERENTLY PLACED EXPOSURES TO THE ROENTGEN RAY IN DETERMINING THE LOCATION OF FOREIGN BODIES IN AND ABOUT THE EYEBALL.*

ILLUSTRATED.

By Charles A. Oliver, A. M., M. D.

ONE OF THE ATTENDING SURGEONS TO THE WILLS' EYE HOSPITAL; ONE OF THE OPHTHALMIC SURGEONS TO THE PHILADELPHIA HOSPITAL, ETC.

The conclusions arrived at in this brief communication are based upon the results with the Roentgen Ray obtained from a series of observations made in three cases that have been recently seen in the writer's practice.

Without giving the details of the clinical histories, and merely mentioning that in each instance the accident was recent and in a previously healthy eye, it will be sufficient to state that it was found by the method adopted that two of the cases showed the presence of foreign bodies in the orbit outside of the eyeball, whilst the third distinctly proved that the object sought for was situated in the interior of the organ.

The method devised by my friend, Dr. Charles Lester Leonard, Associate in the William Pepper Laboratory of Clinical Medicine, to whom full credit should be given, consisted, as opposed to the plan brought forward by Exner,† in the fact that the base line for triangulation is made anterior to the cranial shadow, and the exposures are repeated sufficiently often at fixed distances and set situations, as to give a multiple series of relational sides and angles from which the position of the foreign body can be accurately determined. No fixed apparatus is employed.

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*Read before the American Ophthalmological Society, at the Fourth Triennial Congress of American Physicians and Surgeons, May, 1897.

†Vide *Deutsche medicinische Wochenschrift*, 7th Jan. 1897.

The following scheme, which was used to determine the location of a piece of steel in one of the cases, will serve to illustrate the methods pursued.

Here it will be seen that the foreign body is supposed to be situated at the point X. The question put is, how shall it be located?

The first sensitive plate (shown in black,) is placed in the position PP'. on the side of the patient's head. A point B is taken (if possible anterior to the eyeball), and marked by a lead wire fastened on the surface of the envelope covering the plate. The Crooke's tube is placed upon the opposite side of the skull at a point perpendicular to the plane of the plate (at the fixed point B). This in the figure is shown to be in the position A and at a known distance (12'') from the sensitive plate. In consequence, the shadow of the object X is cast upon the plate at the point C.

This accomplished, a second plate (red line PP'.) is placed in the same position as the first, the point B fixed, and the Crooke's tube placed at a known distance (A' B = 12'') from the point B and at a known distance (A A' = 5'') from tne former position of the tube. As a result the shadow is cast at the point C' on the plate.

By this method the following points from which the distances B D and D X may be determined are obtained, and, in consequence. the position of the foreign body X is gotten.

The data determined are the distance A. B., equalling twelve inches; the distance A' B equalling twelve inches; the distance A A' equalling five inches; the distance B C equalling one and one-fourth inches; the distance B C' equalling one and three-fourth inches; and the angle A B C equalling a right angle.

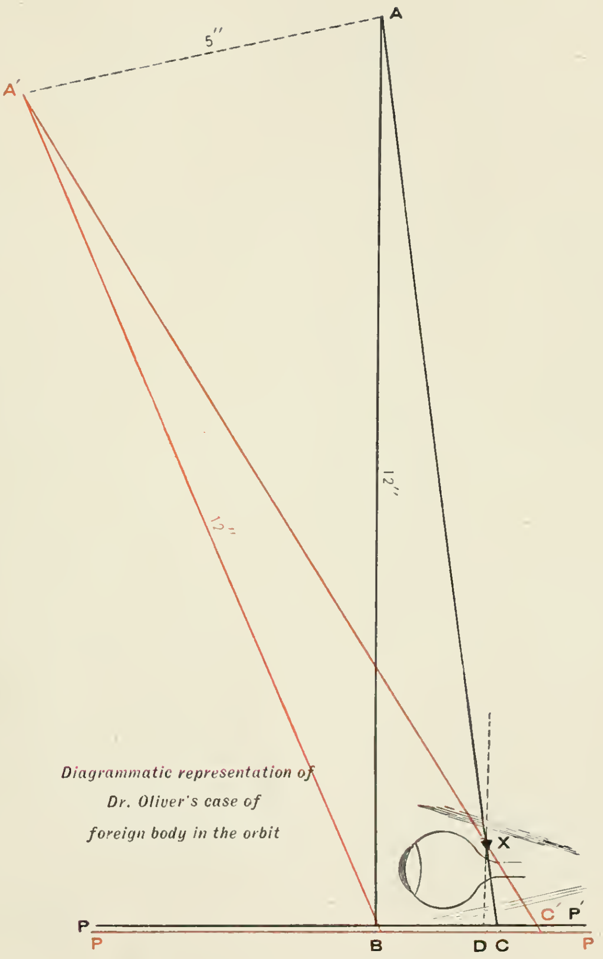
The triangle X D C formed by the perpendicular D X which is parallel to the line A B will be necessary to determine.

In the triangle A B C, two sides and the included angle being known, the remaining factors must, therefore, be known. The angle D X C equalling B A C the angle X C D equalling A C B and the angle X D C equalling a right angle, becomes necessary only to determine one side to get all the factors of this triangle.

The isosceles triangle A B A' having all of its sides known, the angles can, therefore, be determined: The angle A. B A' is therefore, known.

In the triangle A' B C' the sides A' B and B C' are known, and the angle A' B C' equals A B A' plus a right angle; the factors of A' B C' are. therefore, known. In the triangle C X C' the angle C C' X is, therefore. known, the angle X C C' = two right angles minus the known angle X C D and, therefore, as C C' = B C' — B C all the factors of the triangle C X C' can be determined; and all the angles of the triangle B X C have been obtained; and as the side X C common to the two triangles C X C' and C X D has been determined. the sides X D and D C can be determined, and, consequently the distances D X and D B: which was to be proved.

A simpler method. which can be readily comprehended by study of the accompanying cut. is to draw a diagram to scale and to measure the distances accurately.



Diagrammatic representation of Dr. Oliver's case of foreign body in the orbit

PRIMARY SARCOMA OF THE IRIS. A STATISTICAL STUDY, WITH THE REPORT OF AN ADDITIONAL CASE, IN WHICH THE GROWTH WAS SUCCESSFULLY REMOVED BY IRIDECTOMY.

By Clarence A. Veasey, A. M., M. D.,

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ADJUNCT PROFESSOR OF DISEASES OF THE EYE, PHILADELPHIA POLYCLINIC; DEMONSTRATOR OF OPHTHALMOLOGY, JEFFERSON MEDICAL COLLEGE, ETC.

[Illustrated].

Primary sarcoma of the iris is an affection so seldom met with that a report of each isolated case requires no apology. The following notes are from a very interesting case, kindly referred to me by Dr. Joseph J. Burke of this city, from whom the growth was successfully removed by a broad peripheral iridectomy.

M. B., aged 46 years, a male, had been suffering from an inflamed left eye for three weeks when I was first asked to see him at his home. There was excruciating pain in the bulb that extended backward through the temporal region to the left side of the head, accompanied by intense photophobia on the least exposure to light, which was attributed by the patient to an attack of neuralgia. An examination, however, revealed marked peri-corneal injection, a discolored iris, a contracted pupil with numerous posterior synechiæ and what appeared to be a brownish growth in the upper inner quadrant of the iris. Hot compresses at frequent intervals followed by the instillation of a solution of sulphat of atropin was the treatment prescribed, and the patient was told to report at my office on the following day for further examination.

Upon this occasion his vision was found to be for O. D. $^5/_9$ and for O. S. $^5/_{27}$, the latter eye being under the influence of a mydriatic and the patient complaining of everything looking very foggy. The vision of the left eye was unimproved by glasses. An examination of the right eye showed it to be normal with the exception of a low refractive error which, when corrected, gave him perfect visual acuity.

An examination of the left eye showed an evenly dilated pupil except up and in. In this portion there were no synechiæ, but a small brownish tumor of the iris, somewhat ovoidal in shape, could be seen, the lower end of which was pushing the posterior pigment layer of the iris downward and backward giving to the pupil the shape seen in Fig. 1. With the red reflex from the fundus as a background the position of the lower end of the growth could be distinctly observed in the pupillary space. The growth itself was not so long as the entire width of the iris, as some iris tissue seemed unaffected both on the ciliary and pupillary ends, as well as upon the sides. It had the appearance of a foreign body making a bed, as it were, in the stroma of the iris, yet entirely separated from it, and pushing before it as it grew backward, the pigment layer. No blood vessels could be detected passing over its surface nor could any hemorrhages be seen. The capsule of the lens was somewhat cloudy and there remained a ring of pigment spots where the iris had been attached.

No family history of tumors of any kind or specific personal history could be elicited. The patient had some necrosis of one of the bones of the leg many years before, which had been entirely cured. He had three healthy living children.

Upon examining a photograph of the patient taken eight years before, there was a suspicious looking shadow on that portion of the iris occupied by the growth that looked as if it might have been a dark spot. A history of two other attacks of "neuralgia," evidently iritis, during this period affords additional evidence that the growth had existed for some time, though unnoticed by any of the patient's friends or members of his family. For three weeks before my examination it had been increasing rapidly in size and there was present a severe plastic iritis.

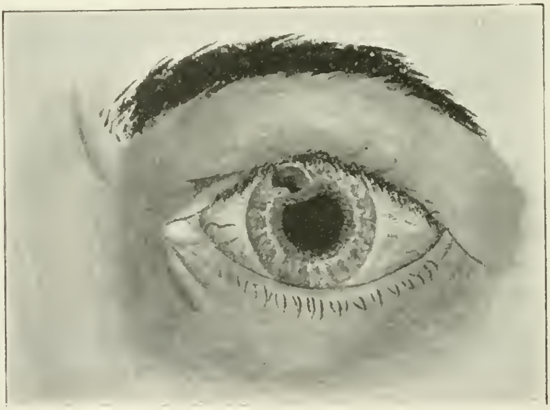

Fig. 1. External appearance of the eye showing the location of the tumor and the peculiar shape of the pupil.

Upon consultation with Dr. George E. de Schweinitz, he agreed with me that the growth was probably a primary sarcoma of the iris, but to give the patient the benefit of the doubt, it was thought proper to administer mercurial innunctions and rapidly increasing doses of potassium iodid for a short time to see what effect might be obtained. These remedies were faithfully employed for one week, at the expiration of which time the growth was nearly twice as large as when first seen and the iritis was fully as bad, the pain still being intense, while the lens as well as the capsule was undoubtedly becoming opaque through the backward pressure of the lower, or pupillary end.

The growth was excised with a broad peripheral iridectomy without complication, except a profuse hemorrhage as soon as the inflamed iris was cut, a bent keratome and ordinary iris forceps being employed, there being no difficulty in drawing it out with the portion of the iris in which it was imbedded. A small tag of the iris caught between the lips of the wound giving some pain for a moment, but as soon as it was released the pain disappeared. The eye made an uneventful recovery notwithstanding iritis was present at the time of operation. The opacity of the lens continued to increase until vision was reduced to light perception when, though much clear lens substance was present, it was extracted through a three millimeter corneal flap without complication. This was about eight months after the first operation. Though the vision in the left eye before the growth was removed by the iridectomy equaled only $^5/_{27}$, after the extraction of the opaque lens, with the correcting glass vision equaled $^5/_6$ and Jaeger 1 was easily read. So far as can be seen there has been no recurrence of the disease, fourteen months having elapsed since the growth was removed.*

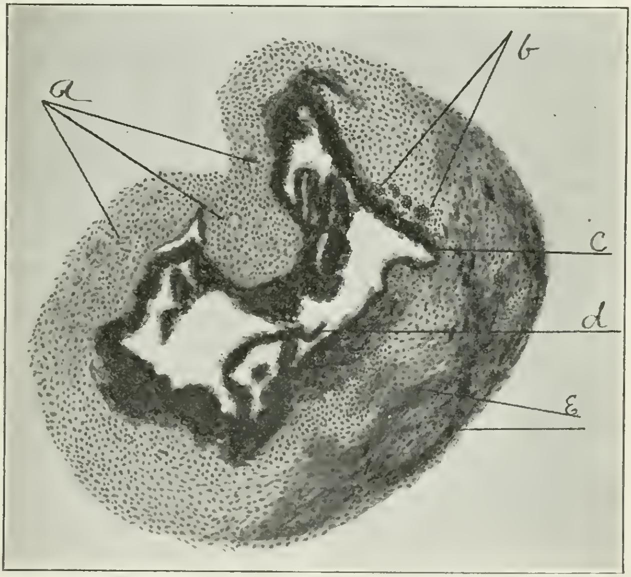

Fig. 2. Low magnification of a section of the tumor: *a*, empty blood-vessels with thickened walls; *b*, blood-vessels containing blood, the walls being composed of tumor cells; *c*, *d*, pigment layer of the iris; *e*, pigment granules.

The tumor was somewhat crescentic in shape, being markedly concave on its inner surface and convex on its outer surface, measuring 2½ millimeters long, 1½ millimeters broad and 1½ millimeters thick. It was hardened in Müeller's fluid, and several sections were submitted to my friend, Dr. H. F. Harris, of the pathological laboratory of the Jefferson Medical College, who kindly furnished me with the following description of the growth and superintended the drawings, which were made by Miss Elizabeth Harding:

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* The patient was examined a few days ago, nineteen months since the operation for the removal of the growth was performed, and no symptom of recurrence was observed.

"Four sections of the tumor were submitted to me for microscopic examination. In general outline and size they are practically identical; in form they are somewhat kidney-shaped. In the center of each is a U shaped open space (See Fig. 2) the convex border of which corresponds with the convex border of the mass. Bounding this opening and forming the inner layer of the tumor is a continuous layer of dark pigment plainly discernable with the unaided eye. The sections of the tumor given to me are thus seen to consist of an irregular but continuous ring surrounding an irregular opening. The convex portion of

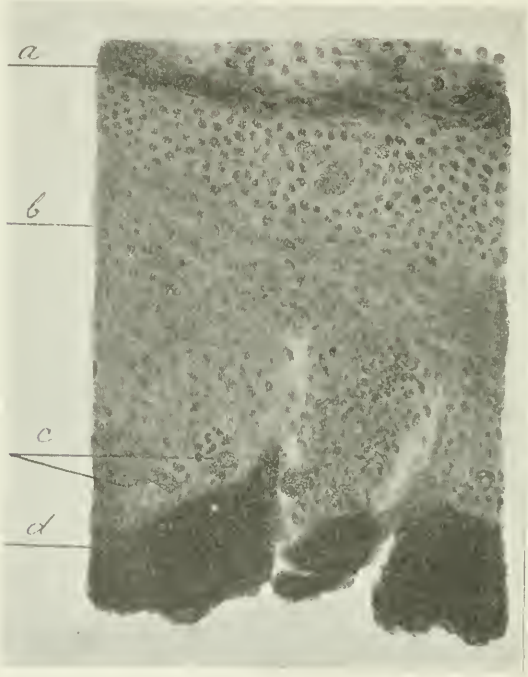

Fig. 3. Higher magnification of a section of the tumor: *a*, masses of granular pigment; *b*. bands of fibrous tissue; *c*, blood-vessels; *d*. pigment layer of the iris.

this ring is more than double the thickness of the concave portion. The portion where the iris was attached is not seen in any of the preparations. This fact and the peculiar shape of the section can only be explained by the supposition that the tumor had grown forward, forming a hollow, somewhat hemispherical mass, the concave surface of which was lined by the pigment layer of the iris and that segments of this mass were cut anterior to its attachments.

"One of the sections was stained with hematoxylin and eosin and the others with carmine.

"Under a low power the tumor was seen to consist of small round cells with a considerable amount of intercellular substance. Numerous blood vessels were seen scattered through the growth. These vessels were especially numerous in the tissue forming the thin concave portion of the ring, and were remarkable for the thickness of their walls and for the fact that they contained no blood. The vessels of the thicker portions were filled with blood and so far as could be seen, had no walls, the blood being apparently in direct contact with the cells of the tumor. Numerous dark brown pigment granules were seen scattered through the tissues of the thicker portions of the ring. This was especially marked around the outer border. The pigment layer surrounding the inner border of the tumor was dark brown, almost black in color, and while continuous, was very irregularly disposed over the surface, several bands projecting into the open space in the center of the mass.

"When examined with higher powers (See Fig. 3) the cells which compose the greater part of the tumor were seen to be small round cells with which were intermingled a few oval ones. These cells were almost of uniform size, having a diameter of from 10 to 12 micro-millimeters. Their nuclei were stained of an almost solid color, both in the hematoxylin and carmine preparations, in no case being sufficiently well preserved, or stained, to show the finer details. The nuclei were surrounded by a thin rim of protoplasm in which there were often imbedded multiples of small pigment growths. In many situations, notably about the center of the thicker portions of the tumor, there is a considerable amount of firmly granular inter-cellular substance. In several places distinct bands of fibrous tissue, and minute bundles of involuntary muscular fibers can be distinguished. Most prominent along its convex border, but scattered throughout the tumor, are numerous masses of granular dark brown pigment varying in size from immeasurably small particles to collections having a diameter considerably greater than that of the cells which compose the tumor. From the pigment layer which covers the inner surface of the tumor numerous fine spiculæ of pigment substance are seen projecting between the neighboring cells. The tumor is, however, much less pigmented here than along the outer border, and, as has been before mentioned, much of this pigment is found within the protoplasm of the cells. The inner pigment layer presents the characteristic appearance of the pigment layers of the iris.

"The tumor is. I think, beyond doubt a pigmented. small round-cell sarcoma."

During the past twenty years several analyses of the previously recorded cases of sarcoma of the iris have been published, the most extensive, however, being those of Fuchs, Andrews and Werther. In 1882, the former published his classical treatise "Das Sarcom des Uveal Tractus," in which he analyzed 16 cases that he had collected from the literature up to that time. In a recent number of the *Archiv f. Augenheilkunde*, F. Werther adds to Fuch's list twenty-three cases collected from the literature appearing between 1882 and 1893. These tables have to a considerable extent evidently been compiled from incomplete abstracts of the original reports, as many of the important details of some of the cases have been omitted in the former, but are found in the latter. In addition, some of the cases have been found to be incorrectly classed: for example, when a non-pigmented sarcoma is placed under the heading "Melanotic," and some of the cases were never operated upon, and are, therefore, useless for statistical purposes.

In the following list, a few cases recorded prior to 1893, that seem to have been overlooked in the previous papers, as well as those that have been reported from that date to the time of writing this paper (February, 1897,) have been added. No case in which the growth was not operated upon, and hence no histological examination made, has been included. Briefly, the principal points in the history of each case are as follows:

Case I.—Adams.—A female, 13 years of age, was brought to the author with a small brown tumor about twice as large as a pin's head, situated on the lower and outer part of the left iris. While treating with mercury the size increased and another mass appeared in the neighborhood of the first. Vision equaled $^{20}/_{50}$. Several opaque spots were observed in the deeper layers of the cornea. Enucleation was performed and the growth was found to be a round-celled sarcoma.

CASE II.—Alt.—This case was a female. 2 years of age. One month before the examination a small growth had been noticed on the right iris. The lens was cataractous. Tension at first was normal, but later became elevated. There were several nodules throughout the iris, the largest being in the lower and outer quadrant. Enucleation was performed, and the growth which originated in the parenchymatous tissue of the iris, was a round-celled sarcoma.

CASE III.—Andrews.—The patient, a female 47 years of age, had noticed discoloration of the left iris at the site of the growth for many years. The vision of this eye had been periodically obscured for fifteen months. There was no pain and the vision of each eye equaled $^{20}/_{100}$. Iridectomy was performed and was followed by suppuration of the lobe, requiring enucleation a week later. Microscopic examination showed that the entire growth had been removed by the iridectomy. There had been no recurrence eight years later.

CASE IV.—Andrews.—The patient was a female, aged 43 years. A small growth on the left iris had been observed for a long time. The tension was elevated, but the vision equaled $^{20}/_{20}$. There was some circum-corneal injection but no pain. Enucleation was performed and the growth proved to be a pigmented spindle-celled sarcoma, originating in the stroma of the iris. The canal of Schlemm was somewhat narrowed and surrounded by a collection of the spindle-shaped cells.

CASE V.—Buffum.—A female, aged 55 years, had noticed a "peculiar appearance" of the right iris for eight years. She had become blind in this eye gradually, after repeated attacks of inflammation. The last attack was present three weeks before the examination. Since then the pain had continued. There was an injected bulb and the tension was about + 2. In the upper part of the iris there was a cyst-like development involving the upper two-thirds. The lower third contained several brownish spots. The aqueous was muddy, the lens hazy, and the fundus indistinguishable. The growth was removed by iridectomy. Recurrence took place in three months. Enucleation was then performed. No recurrence had taken place at the end of eighteen months. The tumor was a spindle-celled sarcoma. The ciliary body had become secondarily involved.

CASE VI.—Carter.—The patient was a male, aged 15 years, who had noticed several small specks on the left iris for three months, and two small specks on the right iris for fourteen days. At the time of the examination there was a yellowish growth half as large as a pea in the lower and inner quadrant of the left iris and small yellowish spots at the margin of the right iris in the external half. There were small circular opaque deposits in the layers of the cornea. The tension was normal and Jaeger 1 could be read with each eye. Iridectomy was performed in the left eye, but the growth recurred.

In the right eye the spots were so enlarged nine months after the operation that only large objects could be seen. The tumor was a round-celled sarcoma.

Case VII.—Charnley.—This patient was a male, aged 16 years. A spot had been observed on the iris eleven years before, and there had been occasional attacks of obstruction of vision from hemorrhage into the anterior chamber. At the time of the examination, there was found on the lower and inner quadrant of the iris a small brownish-gray tumor about one-twentieth of an inch in diameter. Vision equaled $^{6}/_{9}$. Recently red spots had appeared on its surface. It was removed by iridectomy, and proved to be a non-pigmented spindle-celled sarcoma.

Case VIII.—Collins.—A male, aged 21 years, presented himself for the treatment of a brownish growth of the left iris that was situated on the inner and lower quadrant. A photograph of the patient taken four years before the examination showed a brown spot on the lower and outer portion of the iris. At the time of the operation, however, the larger portion of the growth was on the lower and inner quadrant of the iris. Vision equaled $^{6}/_{6}$ and the tension was "full." Enucleation was performed, and the growth, which was a pigmented, small round-celled sarcoma, had not recurred in seventeen months.

Case IX.—Dreschfeld.—A female, aged 53 years, had noticed some trouble with the left iris for two and a half years. Examination showed a reddish-gray tumor about the size of a split pea in the lower part of the iris. The eye was enucleated, and the growth, which probably originated from the inter-muscular tissues of the iris, was a non-pigmented spindle-celled sarcoma. The patient was under observation for several years, there having been no recurrence when last seen.

Case X.—Edsall.—A female, aged 23 years, had observed a small growth on the temporal side of the left iris, midway between the peripheral and pupillary margins, about two years before. At the time of the examination the growth was about the size of a split pea, covering the pupillary space, and of a dark gray color, with a smooth surface. The tension was elevated and the vision equaled $^{20}/_{30}$ through a small hole in the center of the growth. Frequent hemorrhages were observed in the anterior chamber. Although the personal and family histories were negative, mercury and potassium iodide were administered for a time, but without any beneficial result. Enucleation was performed, and the growth was a pigmented small spindle-celled sarcoma.

Case XI.—Ewetzky.—This patient, a male, aged 38 years, had noticed some trouble with his left eye for two weeks. Examination rerevealed a growth in the posterior part of the upper half of the iris, pushing the iris forward and pressing on the lens. The tension was normal at this time but later became elevated. Vision equaled $^{10}/_{70}$. As there was a history of syphilis acquired fifteen years before, the patient was treated with mercury, but vision became reduced to the counting of fingers. Enucleation was then performed, and the growth proved to be a pigmented round-celled sarcoma.

Case XII.—Fano.—The patient was a male, aged 19 years, who had a small brownish growth partially filling the anterior chamber of the left eye. There was some injection of the eyeball and slight vascularization of the cornea with hypopyon. Light could not be distinguished. The cornea was perforated. The operation for stapyhloma was first performed, and a week later the stump was enucleated. The examination showed small regular pigmented cells.

CASE XIII.—Hirschberg..—The patient was a man, aged 38 years, who had noticed a dark spot on the iris of the right eye since childhood, but which had been increasing in size for one year. The visual acuity equaled $^{20}/_{30}$ and the tension was normal. At the time of the operation there was a brownish growth occupying the lower two-thirds of the anterior chamber that had originated in the lower portion of the iris. Enucleation was performed, and microscopically the growth was a pigmented spindle-celled sarcoma, probably originating from the anterior layers of the iris. There was no recurrence in six months.

CASE XIV.—Hosch.—A male, aged 66 years, had observed a brown spot on his right iris since youth. There was some injection in the lower part of the conjunctiva, but no pain. The lower part of the anterior chamber was filled with a light brown growth that was pushing the iris slightly backward and that extended almost to the center of the pupil. Externally, the margin of the tumor was well defined; internally, it disappeared into the iris stroma so that no line of demarcation could be made out macroscopically. The tension was normal and the vision, which at first equaled $^{16}/_{30}$ with a Hm. of 2 D., at the time of the operation equaled $^{16}/_{100}$. The bulb was enucleated, and the growth which was 4 millimeters thick and 7 millimeters high, was confined to the iris, and microscopically proved to be a pigmented spindle-celled sarcoma.

CASE XV.—Kipp.—A male, aged 36 years, had noticed a spot on the right iris twelve years before. For one month it had been growing very rapidly. At the time of the operation there was a whitish growth that covered a large portion of the pupil. Tension was normal and vision equaled $^{20}/_{20}$. The growth began in the lower and inner quadrant of the iris. It was excised by iridectomy, and proved to be a non-pigmented spindle-celled sarcoma, that probably originated in the iris stroma. There was no recurrence in eighteen months.

CASE XVI.—Knapp.—A male, aged 36 years, had a growth occupying about one-third of the iris that was whitish and obstructed the whole pupil when the latter was not dilated. Vision equaled $^{20}/_{70}$. Iridectomy was performed, and there had been no recurrence of the growth at the expiration of a year. The latter was a non-pigmented spindle-celled sarcoma, originating in the iris stroma without any definite line of demarcation.

CASE XVII.—Knapp.—A female, aged 35 years, had a blackish growth about as large as a pea situated in the lower part of the iris that had been present many years. During the four years preceding the examination there had been attacks of iritis and temporary increase of intra-ocular tension. At the time of the examination, however, the tension was normal and the visual acuity equaled $^{20}/_{100}$. There was some lenticular opacity that was supposed to have been congenital. An iridectomy was performed, and the tumor, which proved to be a pigmented spindle-celled sarcoma, grew from the iris stroma without any definite line of demarcation. There were two mild attacks of iritis after the operation, but no recurrence of the growth had taken place in three years.

Case XVIII.—Knapp.—A male, aged 22 years, had observed a small speck in his left iris ten years before. Examination showed a yellowish red growth extending from the iris into the anterior chamber, originating in the lower and outer quadrant and studded with red dots and lines. The tension was normal, although temporarily elevated at times, and the vision was $^{20}/_{20}$. The growth was removed by an iridectomy, and proved to be a non-pigmented round-celled sarcoma, originating from the iris stroma without any definite boundary line.

Case XIX.—Knapp.—A female, aged 53 years, had observed a tumor of the upper and outer quadrant of the iris four months before the examination, that had been rapidly increasing in size. It was rather reddish and about the size of a cherry stone. The tension was normal and the vision equaled the perception of light. The eye was enucleated and the tumor, a round-celled sarcoma, was found to have originated from the root of the iris near the ciliary processes.

Case XX.—Krükow.—A 25-year-old woman, had noticed for more than seven years a small black spot in the upper and outer quadrant of the right iris. The growth filled about one-fourth of the anterior chamber, covered half of the pupillary space, and reached to the cornea. There had been some hemorrhages into the anterior chamber, but these were always absorbed. Vision equaled $^{12}/_{30}$ (myopia $^{1}/_{36}$). Tension was normal. Iridectomy was performed for the removal of the growth, which was a pigmented sarcoma consisting of spindle and round cells. There was no recurrence in one year.

Case XXI.—Lebrun.—A female, aged 36 years, had noticed failing vision for three months, during which time some brownish spots about the size of radish seed were observed near the external periphery of the iris. The eye was blind. After treating for a while with negative results an iridectomy was performed. Inflammatory symptoms were so great, however, that two weeks later enucleation was performed. The growth was a pigmented mixed round and spindle-celled sarcoma.

Case XXII.—Limbourg.—This patient was a female, 7½ years of age, whose vision in the left eye had been much reduced for fourteen days. There was slight episcleral injection and some fine lymph exudate was observed on the posterior surface of the cornea. The anterior chamber appeared to be deeper than normal. The upper and inner part of the iris was occupied by a small yellowish growth with a smooth surface, that reached to the cornea in front. The tension was elevated and vision equaled the counting of fingers at 1 M. The eyeball was enucleated, and the growth proved to be a non-pigmented round-celled sarcoma. The ciliary body and the canal of Schlemm had become secondarily involved.

Case XXIII.—Little.—The patient, a female aged 20 years, gave the history of sudden blindness in the right eye sixteen months before, while stooping. This lasted for about one week. On recovering her vision she noticed for the first time a spot on the colored part of the eye. During these sixteen months there had been three or four attacks of dimness of vision at irregular intervals, but after each attack vision had returned. These were presumed to be due to hemorrhages into the anterior chamber.

At the time of examination there was a pale brown mass about the size of a small pea in the lower and outer quadrant of the iris, that extended from the pupillary margin to the periphery. Vision equaled $^{20}/_{20}$. The growth was removed by an iridectomy, and was found to be a pigmented round-celled sarcoma. There had been no recurrence in twenty-one months.

Case XXIV.—Oemisch.—A female, aged 42 years, had observed six years before a dark spot on the lower and inner quadrant of the iris from which there were occasional hemorrhages. During these periods the vision was markedly reduced. After a period of quiescence it began to grow rapidly. In the anterior chamber there was a dark greyish-blue mass that reached nearly to the surface of the cornea and covered a large part of the lower and inner quadrant of the iris. It was about as large as a pea and reached to the pupillary margin. Iritis had been present. Vision equaled $^{5}/_{9}$. The growth was removed by iridectomy, and was a non-pigmented spindle-celled sarcoma. There was no recurrence in four months and the patient had useful vision, being able to read "calendar figures at 6 M."

Case XV.—Pflüger.—The patient was a female, aged 55 years, who had observed a growth upon the right iris six years before. It had been gradually increasing in size, and there was entire absence of pain. There was a history of malignant disease in the mother, originating in the naso-orbital region and extending to the globe of the eye. In the present case the cornea was normal. In the lower outer quadrant of the iris there was a dark brown tumor of irregular contour, about 3x4x5 mm. in size, extending from the periphery of the iris almost to the pupillary margin. Above the horizontal meridian there was a second smaller growth, separated from the other near the pupil by healthy iris tissue but connected with it near the periphery of the iris. The pupil was round but with mydriasis there seemed to be posterior synechiæ and opacity of the lens and capsule. Vision equaled $^{5}/_{15}$ in each eye. A broad peripheral iridectomy was performed, removing both parts, and there had been no recurrence in two years. The visual acuity remained $^{5}/_{15}$. The growth was a pigmented spindle-celled sarcoma.

Case XXVI.—Pflüger.—In the same paper the author records a case occurring in the practice of Dr. Horner, the history of which is as follows:

A female, 36 years of age, had been aware for ten years of the existence of a small black spot on the lower quadrant of the left iris, that for a short period had been gradually increasing in size. The eyes were not inflamed, the left pupil was oval, and the growth extended from the margin of the pupil to the angle of the anterior chamber. It was removed by iridectomy, and had not recurred at the expiration of three years. The microscopic examination is simply stated to have proved the diagnosis of sarcoma to have been correct.

Case XXVII.—Quaglino and Guiata.—The patient was a female child, aged 6 years, on whose left iris there had been observed a small growth three months before. There was no iritation or severe pain. Tension equaled + 2. The patient could only count fingers, and the mass occupied about two-thirds of the anterior chamber. The parents were perfectly healthy. Enucleation was performed, and was followed by a phlegmonous inflammation of the orbit. Microscopic examination showed the growth to be a pigmented round and spindle-celled sarcoma.

Case XXVIII.—Robertson and Knapp.—A female, aged 24 years, complained of poor vision in the right eye for one year. Examination showed a brownish tumor in the upper and outer part of the iris at the ciliary margin and extending downward from this a chain of three smaller growths, still keeping to the ciliary margin. Vision equaled the counting of fingers and the tension was elevated. Enucleation was performed, and microscopic examination showed the growth to be a pigmented round-celled sarcoma with a few spindle-cells here and there. There had been no recurrence at the expiration of two years. The origin was supposed to have been from the anterior layers of the ciliary portion of the iris.

Case XXIX.—Romieé.—This patient was a female, aged 74 years, who had not seen very well since she was 40 years of age. Examination showed an irregular growth occupying the whole anterior portion of the bulb, the cornea being involved. Enucleation was performed, and the growth was a pigmented small round-celled sarcoma, that had its origin in the upper half of the iris. The retina was found detached, but the lens, choroid and sclera were unaffected. The growth had pierced the cornea in the upper part.

Case XXX.—St. John.—A male, 50 years of age, had noticed a black spot on the left iris for one year. The tension was normal and the vision equaled $^{6}/_{100}$ eccentrically inward. There was a large brown mass filling the external half of the anterior chamber and pushing the iris backward. Pressure on the cornea in front had caused a "hazy spot." The bulb was enucleated, and the growth was a pigmented spindle-celled sarcoma.

Case XXXI.—Sauer.—The patient was a female, 7 years of age. Four months before there had been observed a growth on the left iris that had been rapidly increasing in size. At the time of operation the whole stroma of the iris seemed to have been converted into a tumor mass that occupied the whole anterior chamber. Enucleation was performed, and the growth was a mixed-celled sarcoma, consisting of round, and spindle cells. No recurrence had taken place at the expiration of three years.

Case XXXII.—Schiess.—This case is a most interesting one. A female, 55 years of age, had noticed a gradual failure of vision of the right eye for seven weeks. There were also temporary attacks of increased intra-ocular tension. At the time of examination a tumor was found in the posterior chamber pushing the iris forward. There were also seven large and small brownish spots in the ciliary region of the sclera. The eye was not sensitive nor was there any pain or iritation. The bulb was enucleated, and microscopic examination showed that the ciliary body contained a true melanoma while the growth in the iris was a pigmented spindle-celled sarcoma. The latter was supposed to have been secondary to the first and originated in the upper and inner quadrant of the iris.

Case XXXIII.—Solomon.—A female, 43 years of age, had noticed a small brownish speck about as large as a pin's head, on the outer ciliary margin of the right iris twenty years before. It had been gradually increasing in size and growing toward the pupillary margin, which it overlapped at the time of the operation. The tension was normal and vision equaled $^{20}/_{100}$. The lens was clear but the vitreous cloudy. Enucleation was performed, and the growth proved to be a pigmented round and spindle-celled sarcoma, some cells having passed into the sclera, following the course of Schlemm's canal.

Case XXXIV.—Tay.—A male, aged 25 years, had observed a peculiar growth on the lower half of the left iris for ten years. There was a greyish jelly-like mass covering the pupil, with opaque points scattered through it. The vision remained normal until the pupil was covered by the growth. The eye was enucleated, and the microscopic description of the growth was that of a "medullary cancer with pigment," which in all probability was a sarcoma.

Case XXXV.—Thalberg.—The patient was a female, aged 64 years. Following the extraction of cataract and looking very much like a secondary cataract, there developed in the anterior chamber, filling the pupillary space and involving the iris, a whitish growth. The cornea became somewhat thickened, the tension was increased and vision was totally destroyed. The growth looked so much like a secondary cataract that an operation for the latter was performed. Pain persisted, however, and the growth increased in size so that enucleation was finally performed. The whole iris was found to have been involved by a non-pigmented sarcoma composed of large and small round spindle and polygonal cells. The growth had its origin in the endothelial cells of the iris.

Case XXXVI.—Verter.—A female, 72 years of age, possessed a dark brown tumor of the right iris about the size of a hemp seed, occupying the peripheral portion of the iris and lying closely against the posterior surface of the cornea, occupying about one-third of the anterior chamber. There was present an over ripe cataract, and the eye was blind. There was no pain or irritation and the patient could give no account of the growth. The eyeball was enucleated, and sections of the tumor showed it to be a pigmented spindle-celled sarcoma. The ciliary body, the spaces of the pectinate ligament, the venous plexus, and the equator of the lens were all secondarily involved.

Case XXXVII.—Verter.—This patient was a female, aged 60 years, who had observed some weeks before a small dark cinnamon-colored growth upon the right iris. The media were transparent and the visual acuity equaled $^{2}/_{5}$ with + S 1.50 D. The vision of the left eye was normal with + S 1.50 D. Iridectomy had been advised at the time of first observation of the growth, but at the time consent to the operation was obtained the size was so much increased that enucleation was performed. The tumor was a pigmented spindle-celled sarcoma, and had secondarily involved the ciliary body, Schlemm's canal, Fontana's spaces, and the cornea. A small cyst was also found in the periphery of the retina.

Case XXXVIII.—Walker.—Patient was a female aged 59 years, who had a cataract extracted from the left eye three years before without iridectomy. For a time before the examination the vision had been failing in this eye. There was no pain or inflammatory symptom but inspection showed a pinkish growth filling the pupillary space and strongly resembling secondary cataract. Discission was performed without benefit, the iris being rotten and adherent to the capsule. Three weeks later the eye was enucleated and the mass found to be a small spindle-celled sarcoma. Before enucleation the growth had extended to the cornea in front, obliterating the anterior chamber and looking very much like a large dislocated lens.

Case XXXIX.—Webster and Van Gieson.—The patient was a female, aged 60 years. For four weeks she had seen a "purple mist" before the left eye. There was found a growth about the size of a small pea in the lower and outer quadrant of the iris. The tension was elevated and the vision equaled $^{20}/_{70}$. There was also present anterior polar cataract and edema of the retina. Enucleation was performed, and the growth was found to be a pigmented spindle-celled sarcoma.

Case XL.—Werther.—A female, aged 72 years, had a brownish black semi-globular tumor about the size of a hemp seed in the lower and outer quadrant of the right iris. Enucleation was performed, and the growth was found to be a pigmented spindle-celled sarcoma.

Case XLI.—Werther.—A female, aged 60 years, had observed a few weeks before, a semi-globular, brownish-black tumor of the right iris about the size of a hemp seed. There was a hypermetropia of 1.50D, and the vision equaled $^{2}/_{5}$. The growth was situated in the lower and inner quadrant. The eyeball was removed by enucleation, and the growth proved to be a spindle-celled sarcoma, part pigmented and part non-pigmented. There was also found a cyst formation in the periphery of the retina.

Case XLII.—Whiting.—The patient was a male, aged 49 years, who had observed a spot on the left iris since 10 years of age. Several years before he had consulted Dr. Knapp and at that time the eyeball became occasionally inflamed and there were hemorrhages into the anterior chamber. At the present examination there was a dark brown growth filling the entire inner quadrant of the anterior chamber covering the inferior internal margin of the pupil, which was oblong. There were no synechiæ. The cornea was slightly hazy, from contact at several points. Vision of the right eye equaled $^{20}/_{20}$; of the left, $^{20}/_{70}$. Nine years later the patient returned on account of severe ocular pain and inflammation of the eyeball which was now totally blind. The tension was elevated. Enucleation was performed, and the growth was a pigmented mixed-celled sarcoma, the round cells predominating. The choroid had become secondarily involved and contained a true bony formation.

The case is exceedingly interesting as the growth was watched for a long time, being observed at 10 years of age, remaining harmless for twenty-five years, slowly growing for thirteen years with occasional attacks of iritis and hemorrhage into the anterior chamber, for seven years, there being no doubt as to its malignancy. The patient refused earlier operative interference. There had been no recurrence at the expiration of six months.

Case XLIII.—Wiegmann.—The patient was a female, aged 42 years. At birth there was observed a dark tumor about $2^1/_2$ mm. in diameter on the lower and outer quadrant of the iris, that had remained unchanged until seven months before the examination, when it began to enlarge. The tension was normal and vision equaled $^5/_5$. Iridectomy was performed, and was followed nine months later by the application of the galvano-cautery to a dark spot in the wound. This was repeated in about two weeks The tumor was a pigmented spindle-celled sarcoma, and no recurrence had been noted at the expiration of one year.

Case XLIV.—Williamson.—This patient was a female, 14 years of age. Six months before there had been noticed on the lower and outer quadrant of the left iris a yellowish spot. At the time of the examination the growth reached to the pupillary margin, having begun in the periphery. An attempt was made to remove the tumor by an iridectomy, but this was followed three days later by enucleation of the eyeball, as the growth was found to be firmly attached by deep adhesions. Microscopic examination showed it to be a non-pigmented spindle-celled sarcoma.

Case XLV.—Zellweger.—A female, aged 75 years, had noticed a small spot on the right iris for a long time. During the six weeks preceding the examination it had been growing very rapidly. There had been no pain or inflammatory symptoms at any time. The examination showed a pale, pinkish vascular growth in the lower part of the iris, and beginning cataract. The tension was normal and the vision equaled the counting of fingers at $2^1/_2$ M. The growth was removed by iridectomy, and was a non-pigmented small spindle-celled sarcoma, originating from the anterior layers of the iris. There was no recurrence *in situ* in six months, but as the patient had some loss of appetite the author questions whether a recurrence had taken place by metastasis. Of this there was no later proof.

Arlt refers to two cases from whom the growth was removed by iridectomy, and to a third case requiring enucleation of the eyeball. In neither were there any details of the histories, either prior or subsequent to the operations.

Fuchs, in the discussion of a paper, refers to a case of primary sarcoma of the iris for which the eyeball was enucleated, but the details of the history are too meagre to be of any use.

Cases in which primary sarcoma of the iris was diagnosed but which were not operated upon, are recorded by Berthold, Fuchs, Galezowski, von Graefe, Hasner, Owen, Pflüger, Saltzmann, St. John Roosa and Stober.

It will be seen, therefore, from the above, that there have been recorded forty-six cases of primary sarcomata of the iris in which operative procedures have been undertaken and microscopic examinations made. Of these cases we have 14 males and 32 females, giving in round numbers, 69.5 per cent. of females, and 30.5 per cent. of males.

The ages range as follows:

From 1 to 5 years, 1 case,
From 6 to 15 years. 6 cases,
From 16 to 25 years, 9 cases,
From 26 to 35 years, 1 case,
From 36 to 45 years, 10 cases,
From 46 to 55 years, 9 cases,
From 56 to 65 years, 5 cases,
From 66 to 75 years. 5 cases.

By referring to the table it will be seen that between the ages of 15 and 25 inclusive there occurred 10 cases. and between 35 and 45 inclusive there occured 11 cases. whereas the intervening period, from 25 to 35 contained only 1 case. There seem, therefore, to be two periods during which the disease is most likely to manifest itself. namely, between the ages of 15 and 25 and between the ages of 35 and 45, with a very moderate increase of predisposition in favor of the latter period, the intervening period, that is from 25 to 35, being almost free from the affection as only 1 of the 46 cases occurred during this time. Beyond the age of 45 the predisposition decreases very gradually and, *vice versa*, the nearer we approach this age the greater becomes this predisposition.

It must be considered, however. that the above figures

NOTE.—If instead of analyzing the ages according to decades. we take five year periods. the age of predisposition can be reduced even further. still conforming with the statistics of the above tables.

From 1 to 5 years.	1 case.
" 6 " 10 "	3 cases,
" 11 " 15 "	3 "
" 16 " 20 "	3 "
" 21 " 25 "	6 "
" 26 " 30 "	0 "
" 31 " 35 "	1 case,
" 36 " 40 "	6 cases.
" 41 " 45 "	4 "
" 46 " 50 "	4 "
" 51 " 55 "	5 "
" 56 " 60 "	4 "
" 61 " 65 "	1 case,
" 66 " 70 "	1 "
" 71 " 75 "	4 cases.

It will be seen. therefore. according to this table that from 20 to 25 and from 35 to 40 years of age afford the periods of greatest predisposition. This result entirely agrees with that obtained from the first table. the former, perhaps, being slightly more accurate, as it affords a greater range.

represent in many cases the ages at which the patients were operated upon. But as the greater number of cases were operated upon shortly after coming under the observation of the various authors, and as most of them came under observation shortly after the growths in the iris were discovered, the two periods given represent quite fairly the decades of greatest predisposition.

The youngest case in the list was 2 years of age and the oldest 75 years of age, the average age being 39.3 years.

It is to be noted also that 17 of the cases occurred before the 35th year and 29 after the 35th year; or, if the 40th year be taken as the dividing line, we have an equal number on either side, namely,,23.

As to the ages when the growths were first observed to be in an active state, it is impossible to give any definite statistics. The larger number of patients consulted surgeons within a short time after the discovery of the affection but it must be remembered that many of the growths have the history of originating from apparently dark tumors of the iris, melanomata, which after remaining in a state of quiescence for many years, assumed a malignancy that microscopic examinations afterward proved to be sarcomata.

We find that the left eye has been more frequently affected, though the difference in predisposition is not marked, the actual ratio being as follows:

Right eye affected in 19 cases,
Left eye affected in 21 cases,
Both eyes affected in 1 case,
Not stated, 5 cases.

The tension is given in the histories as follows:

Normal in 11 cases,
Elevated in 16 cases,
Not stated in 19 cases.

In 5 of the cases given as "elevated" the histories state that the tension was normal as a rule, but at times elevated. Thus of those cases in which the condition of the tension is recorded we have 40.7 per cent. normal, 40.7 per cent. elevated, and 18.6 per cent. as varying, being sometimes normal and sometimes elevated. This differs somewhat from the recently published statistics of Devreaux Marshall, who has found in intra-ocular neoplasms affecting the iris or ciliary body that the tension is increased in 35.71 per cent., diminished in 14.28 per cent., and normal in 50 per cent. As his cases were not, however, exclusively primary growths of the iris, but growths affecting either the ciliary body or the iris, or both, being primary and secondary, the difference may be easily accounted for. In no one of the cases of primary sarcomata of the iris was the tension stated to have been diminished.

The condition of the visual acuity in these cases ranged thus:

Normal in 9 cases,
20/100 or better, in 14 cases,
Less than 20/100 in 8 cases,
Light perception in 2 cases,
Blind in 6 cases,
Not stated in 8 cases.

In some of the cases the lens was more or less cataractous (Alt's, Knapp's, Oemisch's, Verter's, and my own). In the latter case after the extraction of the lens the patient obtained vision equal to 5/6 and easily read Jaeger 1.

The positions occupied by the tumors on the surfaces of the irides are variously given as follows:

Lower and inner quadrant, 7 cases,
Lower and outer quadrant, 11 cases,
Upper and inner quadrant, 3 cases,
Upper and outer quadrant, 3 cases,
Lower half, 5 cases,
Upper half, 3 cases,
Outer half, 2 cases,
Not stated, 13 cases.

Of the 32 definitely stated cases we have, therefore, 23 cases, or 71.8 per cent., originating from the lower half of the iris, and 9 cases, or 28.2 per cent., originating from the upper half of the iris. There also seems to be a somewhat greater predisposition to occur in the outer portion of the lower half, or in the lower outer quadrant of the iris.

The operations that were performed in the recorded cases were:

Enucleation in 32 cases,
Iridectomy in 14 cases.

In the above 32 cases under the heading "Enucleation" are included 4 cases in which iridectomy was first performed, and in which enucleation was subsequently required. In Andrews' case enucleation was performed a week after the iridectomy because of suppuration of the globe; in Lebrun's case it was performed two weeks later because of "inflammatory symptoms" in the globe; in Williamson's case three days later because the iridectomy disclosed the fact that the growth was attached by "deep adhesions;" in Buffum's case three months later because of recurrence. In Carter's case the growth recurred, but it was so distinctly unfavorable at the time of operating that nothing else could have been expected. So that we have out of 46 cases operated upon the successful removal of the growth in 13 cases by iridectomies in which no recurrence is recorded during the time they remained under observation, which varied from four months to many years. In none of the enucleations are recurrences positively recorded, but in one (Zellweger's case) a loss of appetite with some gastro-intestinal disturbance was looked upon as probably the beginning of a metastatic process although no subsequent mention is made of it.

The histological examinations of the growths showed that

27 cases were pigmented,
10 cases were non-pigmented,
9 cases not definitely stated.

It seems somewhat odd that in a tissue so highly pigmented as the iris we should have a non-pigmented growth, yet in the 37 cases definitely recorded we have in round numbers 27 per cent. of the non-pigmented variety and 73 per cent. of the pigmented variety.

As to the cellular formation of the growths we have

23 cases of spindle-celled,
11 cases of round-celled,
7 cases of mixed-celled,
5 cases not definitely stated.

This, in round numbers places in the spindle-celled classification 56 per cent.; in the round-celled classification 27 per cent.; and in the mixed-celled classification 17 per cent. of the reported cases.

Symptoms.

From a study of the recorded cases it is seen that primary sarcoma of the iris may occur at almost any age, the youngest being 2 years, the oldest 75 years of age, the periods of greatest predisposition being between the 15th and 25th, and between the 35th and the 45th years. As a rule it is first observed as a spot of discoloration upon the iris which, after a period of quiescence, varying from a few weeks to many years, begins to increase rapidly in size, interfering with vision according to the degree of inflammation it has caused and the amount of pupillary space covered. Vision is also sometimes obscured for short periods of time by transient increase of the intra-ocular tension or by hemorrhage from the growth into the anterior chamber. Sooner or later it is apt to produce iritis and by pressure backward to cause opacity of the capsule and lens. Tension is presumably increased when the growth attains sufficient size, or has brought about sufficiently violent inflammation to interfere with the interchange of the ocular fluids. If left to itself it attains considerable size, perforating the external coats of the eye, and usually produces blindness. It occurs twice as frequently in females as in males, each eye seems to be equally predisposed and the favorite position seems to be in the lower half, and especially in the lower and outer quadrant of the iris.

Diagnosis.

Primary sarcoma of the iris may be mistaken for simple melanoma, for gumma, or for primary tubercle of the iris.

A simple melanoma becomes darker and darker while a melano-sarcoma ordinarily retains its primary shade. A melanoma is also a congenital growth while sarcoma is not. If the patient, or patient's family, can give no accurate information on this point the growth must be watched for some time to note if there is any progress (Fuchs).

Whenever a gumma of the iris appears there is a severe iritis, whereas in the early stage of sarcoma of the iris there are no inflammatory symptoms. In gumma of the iris, also, there is a specific history with other symptoms referable to syphilitic infection. The color of the gumma is either an iron-red or deep yellowish-red, while that of sarcoma is reddish-gray, blackish or light brown, or flesh-color (Andrews). Gumma is non-vascular and yellowish-white in color at the summit, but at the base it is vascular and has a yellowish-red border (Fuchs). If the diagnosis cannot be positively made from the examination, the administration of anti-syphilitic remedies for a short time in large doses will clear up the matter.

Tubercle of the iris is of much more rapid growth than sarcoma and in color is of a light yellowish-white, or light grayish-white, or light grayish-yellow (Andrews). As a rule no vessels are seen on its surface, whereas in sarcoma superficial vascularization can usually be detected. The larger number of cases of tubercle have occurred in subjects under 15 years of age, whereas the larger number of cases of sarcoma have been found in older persons. Tubercle is much more irregular in form than sarcoma, and the accompanying inflammatory symptoms also appear earlier.

Treatment.

If the growth is sufficiently small and does not extend to the extreme ciliary portion of the iris an attempt should be made to remove it by an extremely broad peripheral iridectomy. The statistics conclusively prove that in many cases not only has the eyeball been preserved, but with useful vision, and that no recurrence had been noted years after the removal of the growth by this operation. If the growth, however, is so large, or is situated so near the ciliary margin of the iris that it is impossible to remove all of it by an iridectomy, or if any other portion of the eye has become secondarily involved, immediate enucleation should be performed.

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ABSTRACTS FROM RECENT GERMAN OPHTHALMIC LITERATURE.

Quarter Ending October 1st, 1897.

BY

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Fibro-neuroma of Orbit and Buphthalmus.—Operative Treatment of Myopic Asthenopia.—Thrombo-phlebitis of the Central Retinal Vessels.—Erythropsia.—Cilio-retinal Vessels.—Tuberculosis of Conjunctiva.—Diplococcus of Fraenkel and Acute Catarrhal Conjunctivitis. Graduation of squint Operation.—Euphthalmin.—Pilocarpin in Glaucoma. Cystic Enlargement of Walls of Orbit.—Treatment of Trachoma by Iodine.—Ophthalmoscopic Examination in Multiple Sclerosis.—Spasms of Ocular Muscles in Athetosis. Operative Treatment of High Myopia.—Geographical Distribution of Trachoma.—Magnet Operations.—Absence of Pupillary Reaction with Persisting Light Perception.—Ocular Disturbances of Dwarfism and Giantism.—Pseudo-Glioma of the Retina.—Osteoplastic Opening of Orbit in Resection of the First Branch of the Trigeminal Nerve.

Fibro-Neuroma of the Orbit with Secondary Buphthalmus.

Sachsalber, A. (*Beitr. z. Augenkde*, XXVII., June 22, 1897,) describes a case of fibro-neuroma of the orbit and buphthalmus, occurring in a girl of 7 years whose eyeball was first enucleated, and afterward exenteration done with cure and satisfactory cosmetic result. The skin over the tumor was greatly thickened; the eye pointed outward and downward. He considered the relation of the buphthalmus to the primary disease to arise from the nerves in the choroid caused by secondary disturbance of nutrition, which occasioned diffuse proliferation of connective tissue and proceeded to disease of the entire lymph system, and finally to inflammatory changes with entire obliteration of the normal bloodvessels. He has not found any references in literature of buphthalmus to fibro-neuroma, except the cases of two brothers, reported by Bruns, in which the bulbs were found atrophied, which Bruns considered to have followed suppuration. The article is illustrated by figures of microscopic sections of the tumors and eyeball and a photograph of the patient. H. V. W.

Operative Treatment of Myopic Asthenopia.

Gelpke & Bihler, (*Beitr. z. Augenhkde*, XXVIII., July 31, 1897,) treat comprehensively of operation for myopia, occupying full number of the Beiträge in 172 pages. After a short history of the operation they describe preliminary examination, which should include the visual acuity, nature of the subjective symptoms which are caused by correcting concave glasses, the age, the history, and the general examination in which is included the visual field, the tension, the measurement of the cornea, etc. The indications for the operation are given as follows: 1. It is the rule in all cases of myopia which cannot be properly corrected by lenses, so that sufficient useful vision results, be they young or old, be the myopia complicated with external or internal changes of the eye, be the myopia relatively weak or relatively high, both sides should be operated upon. As the results of their operations it is claimed that through the phakolyses the visual acuity of all cases has been raised and in no case has been reduced. 2. That the results, *quo ad visum*, are just as good if the myopia be of a moderate or of a high grade. 3. That the result of complicated cases is seemingly better than in those which are not complicated. 4. That in the use of strong convex lenses, even to 8 D., after the operation upon a moderately myopic eye, is not unpleasant to the patient, and has been found much more agreeable than the carrying or the previously strong concave glasses. 5. That it is not sufficient in most cases to operate on one eye, but it is better to remove the lens from both. 6. That the age of the patient makes no difference. They consider that cases differ in the indications, and are to be selected accordingly. From the years 1893 to 1896, inclusive, they saw 303 cases of myopia, of which 88 (29 %) were of a high grade (over 8 D.), and 7.4 % of these were recommended for operations, about two-thirds of which accepted the same. They discide the lens after thorough asepsis for a couple of weeks, doing a deep discission. In 7 cases the lens material was absorbed through one or two discissions. If the lens swells they remove it by extraction by placing the wound in the upper half of the cornea. They do not consider that iridectomy is at all needed in young people. In other cases it may be needed. From June '93 to April '97 they have operated on 56 myopes with 74 eyes. From these they have reached a definite conclusion from the first of April on 59 eyes of 46 patients. In the other 10 cases the result was not yet complete, they being still under observation. Visual fields are given in each case, and in every case is larger than before. Thirty-three of these cases had one eye operated upon, and 13 cases had both eyes. Their ages ranged from 10 years to 60 years, four being under 10 years; four, 11 years to 15; fifteen, 16 to 20; nineteen, 21 to 30; one, 31 to 40; three, 41 to 60. The youngest case was 7, the oldest 47. There were staphylomata postica in 48 eyes, changes of the macula in 7, and opacity of the cornea in 4. One discission was done in 27 eyes; two in 22; three in 8; four in 1; five in 1. In all, there were 104 discissions, 54 extractions, 5 sclerotomies, and 4 iridectomies, making 167 operations. A résume of their clinical observations and results of the operations is as follows: 1. Indication for the operation depends principally on the myopic asthenopia. If the central vision of the myope, after the best possible correction, is not sufficient for his purposes and social standing, he should be operated upon, no matter whether his myopia is moderate or of a high degree, or complicated, as in such cases a sufficient and for the individual a satisfactory increase of the vision is obtained by the operation. 2. Should the operation be indicated only on account of excessive myopia, and the patient be enabled to wear strong concave glasses easily, it is recommended not to operate upon myopes under 16 to to 18 D., as such myopes are rendered nearly emmetropic by the operation. Bihler writes upon the changes in the refraction in these cases, giving a classical review of the optical principles involved in the latter part of the article, showing the principles upon which the visual acuity is increased and the visual field enlarged. The literature of the subject is appended. H. V. W.

Thrombo-Phlebitis of the Central Retinal Vessels with Necropsy.

Wurdemann, H. V., Milwaukee, (*Beitr. z. Augenhkde*, XXIX., Sept. 18th, 1897,) presents the history of a case of thrombo-phlebitis of the central retinal vessels, occurring in a boy aged 8 years, who had sudden blindness in left eye four days before; two weeks preceding he had mumps.

The eye was totally blind; no reaction of pupil to light, or accommodation, although associated movements were normal. The optic disc was obliterated, but not swollen; the arteries were small and lost at the edge of the disk; the veins were dilated and tortuous, sausage-like, with black-red, apparently coagulated blood in them. There were serous exudations around, and a red spot at the macula suggested embolism, but which was a true hemorrhage. The eye remained blind despite large doses of K. I. One month later, there had been great changes in the fundus, which then showed atrophy of the optic nerve and retina and beginning connective tissue formation. One year later the boy had several inflammatory attacks in the blind eye, which were characteristic of glaucoma. The symptoms not being subdued by eserin, nor pain controlled by morphin, enucleation was made, the case recovering and an artificial eye being worn. The bisected eyeball, mounted in gelatin, shows connective tissue formation in the vitreous. The main changes were in the retina, choroid and optic nerve; microscopic examination of which showed in region of the macula, in site of some of the old hemorrhages, degenerated red corpuscles in the granular layer of the retina. Most interesting was the condition of the nerve, in which the sections showed clearly the antecedent process of phlebitis and thrombosis; the artery being occluded by a granular mass of degenerated blood corpuscles in a fibrinous clot. There was also a clot in the vein. The progress of the case was observed through the various stages of phlebitis, vasculitis and perivasculitis, stoppage of the circulation, and subsequent obliteration of the vessels, with degeneration and loss of function of the structures cut off from the blood supply. Following this, there was proliferation of connective tissue, formation of membraneous bands in the vitreous and fibroid degeneration of the various structures, resulting in occlusion of the lymphatic channels and glaucoma.

H. V. W.

Erythropsia.

Snellen, (*Archiv. f. Ophth.*, XLIV., 1, 1897,) looks for an explanation for the erythropsia that frequently annoys patients whose lenses have been extracted, especially those with coloboma of iris, or dilated pupil, and finds its cause in the translucence of the vascular eyelid and the walls of the eye. Light can be reflected into an eye through the lid and through the sclera and its reflection seen through the pupil. The aphakic patient half closes the eye in a strong light, and, if the lid is sufficiently thin and translucent, the retinal periphery will be more red than the other parts of the retina that receive their light through the uncovered part of the pupil. Fuchs found, when entering a dimly lighted room after exposing the eye to the strong glare of a snow field, that light surfaces had a red tint and darker shades a complementary green. S. explains this on his theory that during exposure of the eye to the snow surface much of the reflected light passed through the lid and sclera, and thus, when the retinal periphery is tinted red, the contrast color, green, will develop in the center. Additional confirmatory experiments were made with tinted glass. S. concludes that erythropsia finds its explanation in after images and contrast effects, with the condition that for its development one part of the retina must receive its light from a more intense colored source. H. V. W.

Cilio-retinal Vessels.

ELSCHNIG, A. (*Archiv. f. Ophth.*, XLIV., 1, 1897), reports his minute anatomical studies of 13 cilio-retinal arteries (in 11 eyes), discovered during life, and divides them into three groups, according to their origin and course: 1. Those in which the cilio-retinal vessel, as a branch of the arterial circle of Zinn, penetrates the sclera at an angle, and, without touching the choroid or sending off a branch into it, enters the intra-scleral (1 case), or intra-choroidal (2 cases) part of the optic nerve, and curving, joins the fibers of the nerve to the retina. 2. Those cases in which a branch of the scleral group of vessels touches or penetrates the choroid near its papillary end, these dividing into two or more branches, one of which passes into the retina as the cilio-retinal artery, the other branching further into the choroid: the cilio-retinal artery may act here as the direct continuation of the scleral arterial circle (3 cases), or as a small branch of it (1 case). 3. The cilio-retinal artery may come from a choroidal vessel which is itself a distant branch of the scleral circle of vessels (4 cases). All cilio-retinal arteries examined were found to be branches of the scleral group of vessels. A further conclusion arrived at is that the cilio-retinal are end arteries, and cannot serve for the establishment of collateral circulation in case of embolism of the central retinal artery. Neither the author's nor others studies have been very successful in following the cilio-retinal veins after they leave the retina, and their course still remains very uncertain. H. V. W.

Contribution to Tuberculosis of the Conjunctiva.

GRUNERT, C. (*Archiv. f. Augenhkde*, XXXIV., II., 1897.) To the 72 cases which Denig has collected the author adds one new one, in a 27-year-old bookbinder, who, in 1892, had noticed a little lump in the upper eyelid, which was removed in 1893, but soon returned. It was again operated upon in 1894, burned and cauterized, without result. In 1895 the following appearance was observed: Great swelling of the upper eyelid; the skin reddened, smooth and shining; the commissure shortened. Upon the tarsal conjunctiva of the under lid, near the fold of transmission, there were observed two lumps of a longish form, parallel to the edge of the lid, of a reddish opaque color, which resembled the frog spawn like trachoma bodies, and were of the same consistence. Upon the under surface of the upper eyelid, which is readily everted, there were observed lumpy formations and granulations which looked like condylomata, but which were deeply and superficially ulcerated and covered with muco-purulent secretion, which was readily removed. Between these ulcerations stringy or raylike cicatricies were seen. The majority of these were of a dark reddish color and uneven, opaque, and of a hard consistence of the opposite appearance to the changes in the lower lid. The eyeball was intact. Upon the left temple, 1½ cm. from the outer canthus, there was a red spot in the skin of the size of a penny, in the middle of which was a little depression with swollen, irregular edges. This ulcer had existed for about 1½ years. The preauricular gland of the left side was swollen. Sputum examination showed tubercle bacilli. The lumps upon both lids and the ulcer of the temple were removed. Examination of the excised portion showed typical epitheloid tubercle, with giant cells in moderate amount and cheesy formation, as well as tubercle bacilli. Inoculation experiment gave a positive result. The course of the case was most excellent, as two months later he was generally in good health and had no return of the local disease. Tuberculosis of the conjunctiva, as is well shown in this case, is an ectogeneous affection, and is different from tubercle disease of the inside of the eye, iris, choroid, etc., in which the infection is endogeneous. The observation of Rein that the commonest cause of infection of the conjunctiva is rubbing of the eye with the hand is well shown in this case, for the man was left-handed, and he infected his left eye and scratched his temple with his left hand. H. V. W.

The Diplococcus of Fraenkel as a Common Cause of Acute Catarrhal Conjunctivitis.

GIFFORD, H., Omaha, (*Archiv. f. Augenhkde*, XXXIV., II., 1897.) In 40 cases of typical acute conjunctivitis the author could not find Weeke's bacillus, but in every one the Fraenkel diplococcus. In 12 of these, cultures were also made, in the most of which pure cultures resulted. Inoculation with a small amount of the secretion caused an acute conjunctivitis in which cocci were afterward found, which grew on agar producing pure cultures of Fraenkel's diplococcus. Secretion from the conjunctiva of the author's eyes inoculated into his assistant's eye caused a pneumococcus conjunctivitis in 48 hours, which pursued a mild course. Later inoculation of the same conjunctiva proved without result, so that immunity seemed conferred. The author could not, any more than Aschenfeld, produce an acute conjunctivitis with pure cultures. He could with anaërobic cultures, made according to the method of Büchner, upon serum agar. Pneumococcus conjunctivitis is not exclusively confined to children. One-half of his cases were in young adults. The period of incubation in the natural cases seemed to be about 48 hours. Inoculation experiment, in two cases was 48 hours, one case 22, and the other 72 hours. It is questionable whether this inflammation is caused by a peculiar variety of pneumococcus. In the microscopic preparations the colonies of the diplococci did not seem so clearly lanced shape as those taken from the pus of empyema.

H. V. W.

The Graduation of the Squint Operation.

LANDOLT, ÉDM., Paris, (*Archiv. f. Augenhkde*, XXXIV., 4, 1997), says that we cannot speak of obtaining a certain effect by "graduation" in squint operations until the nature of strabismus and the action of the operations for it are better understood. He accepts Donders' theory that concomitant strasbismus is a binocular affection, which seems to call for strengthening of the weakened muscles, although, as a rule, the opposing muscles are weakened. The center of rotation being by no means a fixed point in space, from the effect of a tenotomy the opponent muscles gain ascendancy and draw the eyeball forward, the tenotomized muscle being re-attached further back of the ball. The retraction is likewise due to rotation of the eyeball from contraction of the antagonist and because the tenotomized muscles contract more than the others, being stronger. The motility of the eyeball suffers from the tension of the check ligaments. The advocates of tenotomy concede that its success depends upon decreased mobility. The antagonist muscle does not gain what the tenotomized muscle loses, as by the operation the eye is drawn forward out of the muscle cone and the influence upon rotation lessened. Advancement, however, forces the eye deeper into the socket and the muscles embrace it more extensively, increasing the mobility. Increasing the strength of a muscle by advancement does not limit the function of the antagonists. In twenty years practice L. has never produced over-correction of strabismus. The advancement has also the cosmetic advantage of not causing protrusion of the eyeball, sinking of the caruncle, or exposure of the sclera. We can hardly regulate the re-insertion of a divided or advanced muscle upon the globe. Its action does not depend merely upon its attachment. We cannot graduate the effect during the operation; nature does it if we make use of its efficient help, against us if we neglect it. We must, in addition to the operation, resusticate and strengthen the association of convergence, accommodation, and of binocular vision. Mydriatics, spheric, cylindric and prismatic glasses are necessary. Graduation is affected by optic and orthoptic treatment. L. operates through a vertical conjunctival incision, resecting the tendon in high degrees of strabismus, the tendon being re-attached by threads passed through the tendon and before and below in the epi-scleral tissue. In convergent squint atropin is instilled. *Binocular bandage is used for five days.* In convergent strabismus sometimes longer. *He keeps the patient in bed for six days.* Persons operated upon for squint are not allowed to walk about. He requires a binocular bandage, rest in bed, and careful watching. H. V. W.

Euphthalmin, a New Mydriatic.

TREUTLER, B., Marburg, (*Klin. Mon. f. Augenhkde,* Sept., 1897), contributes an article upon this new addition to our mydriatics, which has been developed by the Actien Chemical Works. N-methylvinyldiacetonalkamin is a strong mydriatic, a derivation of hydrochloric salt of formobenzoilic acid. He tried solutions varying from 2 % 10 %. Very slight irritation is caused by the weaker solutions; by the 10 % about as much as the 4 % cocain, and much less than 2 % eucain. Full dilatation results in 60 to 80 minutes; 2 drops of 2 % (8 : 9 mm. diam.) In four to five hours it is again normal. Seldom does any effect remain after 12 hours. In old persons mydriasis is slower and not so complete. Accommodation is affected in 10 to 15 minutes, micropia then beginning. Accommodation is not fully suspended; the effects last two or three hours. The subjective symptoms of euphthalmin are slight and of short duration. Euphthalmin is a strong mydriatic. It enlarges the pupil in 5 – 10 % solution to a maximum in about half the time as a 1 % homatropin. In old persons it does not work as quickly or as strongly as in young persons. It has an advantage over cocain (as a mydriatic), as it works more strongly and leaves the epithelium intact, although mydriasis comes later. The accommodation is less affected by euphthalmin than by homatropin. The recovery from the mydriasis and accommodation paralysis is much sooner than in the case of homatropin. No systemic effects have yet been observed. The new mydriatic has the advantage over others principally on account of its short duration. H. V. W.

Pilocarpin in Therapy of Glaucoma.

HOHLMANN, F. W., Coblentz-Ems, (*Klin. Monatsbl. f. Augenhkde*, Aug. 1897), reports the case of a woman who came to him in June, 1896, then aged 54, who had been treated under the diagnosis of irodo-cyclitis with atropin, with the result of producing an acute glaucoma in one eye, the other eye normal vision, 5/III. An iridectomy was made with favorable results. The day after the operation the patient saw rainbow colors with the hitherto sound eye and symptoms of acute glaucoma set in, which were very readily controlled by a 2 % pilocarpin solution, the vision being ultimately restored to 5/IV. The patient had to keep up the use of pilocarpin in ½ % solution, otherwise symptoms of glaucoma would set in. Several attacks occurred which were controlled by 2 % solution, and during another attack 1 per cent. of eserin was used by another physician on account of the patient's change of residence, but this drug produced psychic disturbances, making the patient extremely nervous, so that pilocarpin was usually exhibited. In the last attack she became blinded so much that there was nothing to hope from an operation. The patient finally died of inanition, her mental condition becoming deplorable, and becoming entirely blind. This case is of decided interest on account of her using myotics daily for ten years, and on account of the change from pilocarpin to eserin, and the unhappy change produced thereby, and the fear she had of an operation. The author remarks, perhaps she might not have died so soon if eserin had not been used. He states that it is possible to control some cases of glaucoma through use of myotics, but many psychic disturbances are produced by eserin in hysteric and neurotic persons. He has had two cases in which operation was not consented to on account of the fear of the patient in which the symptoms were not controlled by eserin. In one case he used 3 per cent. pilocarpin solution, which at the time subdued the symptoms and rendered operation unnecessary. Later on the patient went to another physician, who used treatment very similar. Eserin is not so well tolerated, especially in simple glaucoma, in which it is not the rule to make an iridectomy. H. V. W.

Two Cases of Cystic Enlargement of the Bony Walls of the Orbit.

Steiner, L., Soerabaya, Java. (*Centralbl. f. prakt. Augenhkde*, June, 1897), presents two cases, the first of which was a cystic enlargement of the frontal sinus, occurring in an old Javanese, who had a large growth in the upper half of the eye which had grown slowly for three years, and which now covered the eyeball. Puncture was made and 150 grams of a chocolate colored thin mucus escaped. The cyst filled up and was operated upon through an incision made through the brow, opening up a spherical depression of the frontal bone about 4 cm. in diameter and about 3 to 5 cm. wide, which seemed to be a diverticulum of the cyst. This was followed up by the probe, but did not reach the nose. A thick trochar was passed through this opening to the nose and new communication established between the frontal cells and the nasal passage. A portion of the anterior skin wall of the cyst was resected and sewn together. The patient regained useful vision of the eye. In the second case there was an enormous mucous cyst arising from the inner canthus in the neighborhood of the ethmoid bone, from which, on puncture, 200 grams of a thick, brown fluid was removed. In the illustration this appears of the size of an orange. The patient was an old Javanese and did not remain under observation sufficiently long to tell whether cyst would be reproduced, or to determine the exact topographic relation. A little over a month after the puncture patient had regained use of eye, which had not been affected by the cyst. H. V. W.

The Treatment of Trachoma by Solutions of Iodin.

NESNAMOFF. E. A. *Centralbl. f. prakt. Augenhkde*, Aug. 1897, and also in *Vratch*, No. 17, 1897), recommended first, in 1895, for treatment of trachoma, and other eye diseases, solutions of iodin in white vaselin oil, glycerin and ether. Observations have since been made in Loeber's clinic in Heidelberg and clinic of Charkow University. N. claims that in two or three weeks, by 1 per cent. solutions in oil, follicular trachoma can be cured, and in but a little more time severer forms are more quickly relieved than by any other forms of treatment. Jakowleff treated 144 men in his regiment, of whom 77 had a bad form of trachoma, and the others a mild form.. In four months 50 men had been entirely cured and all others improved. Jakowleff says solution of iodin in white vaselin oil will cure any form of trachoma, and trachomatous pannus is quickly relieved, and trachomatous cicatricies acquire fine blood vessels, so that, in the end, the conjunctiva looks normal. When the infiltration is more uniform (the gelatinous form of Stellwag), 2 to 3 per cent., may be used. Strong solutions act energetically, but cause so much irritation that treatment cannot be carried out daily. In more serious cases the results of treatment were less brilliant. The medicine acts well in all conjunctival diseases that have papillary enlargement. N. and others have made observations in hundreds of cases. Iodin causes resorption of the lymphoid elements, and even in weak solutions (1:500) kills the spores of the bacilli. The best solvent for iodine is, perhaps, ether, but vaselin oil will take up 1½ per cent. iodine. If stronger solutions are needed ether must be added. In acute cases of trachoma he begins with ½ per cent. solution in glycerin. In severe cases, when the patient bears 1 per cent. solution well, he may even use 3 to 4 per cent, according to the following formula:

R Iodi puri . . . . . . 2,0—3,0
Ol. vaseline albi . . 100,0
Aetheris sulfur. q. s.
Ad solutum completam.

The method of application is to evert the eyelids in such a manner that the cornea is protected, and then to pass a cotton brush, impregnated with the iodin solution, two or three times over the membrane; if wet, it is necessary to dry it. The iodine causes a yellow or brown stain which rapidly disappears. In cases that cannot remain for treatment he prescribes 1 per cent. to 2 per cent. solution of iodine, to be dropped in the eye of the patient when home. The only indication against the use is where the conjunctiva is very swollen and edematous; after this period passes by he uses weak and then stronger solutions. He considers iodine in vaselin oil as the very best medicine in purulent inflammation of the lachrymal sac. In two or three injections the suppuration ceases. In no case has an eye become worse through the treatment. H. V. W.

The Importance of Ophthalmoscopic Examination for Early Diagnosis of Multiple Sclerosis.

NAGEL, G. (*Munch. Med. Woch.*, No. 32, 1898), calls attention to the importance attached to ocular disturbances in multiple sclerosis, but emphasizes especially an ophthalmoscopic finding recently noted in two cases; in one case a one-sided, in the other a double-sided atrophy of the temporal side of the papilla. Such a condition, especially when associated with other ocular disturbances, such as nystagmus or motor palsies, should arouse a suspicion of multiple sclerosis. He also calls attention to the disproportion between the retinal change and the functional disturbance, for in neither of the reported cases was there more than a very slight impairment of vision.

H. V. W.

Spasms of Ocular Muscles in Athetosis.

KUHN, CARL, (*Deut. Med. Woch.*, No. 24, 1897). In a case of athetosis of hands and face following traumatism, K. noticed movements of the eyeball, which, in their peculiar characteristics, were similar in every respect to the movements in the other affected parts. Whatever the cause of athetosis, whether a disease *sui generis*, or simply a group of irritation phenomena, the same explanation must apply to these ocular muscle cramps as apply to those of the extremities. H. V. W.

Operative Treatment of Myopia of High Degree.

V. HIPPEL, A. (*Deut. Med. Woch.*, Nov. 25, 1897), reports having operated by discission and extraction of lens in 114 cases of myopia, an operation which, though known a century ago, was brought into prominence by Fukola in 1889. H. confines interference to children and young individuals in whom the myopia shows a progressive tendency, and to myopics who cannot comfortably follow their occupation with the use of glasses, in no case operating, however, unless the myopia has advanced to at least 12 D. The operation is relatively without danger and the improvement in vision is marked. A statistical table of the 114 cases operated upon is appended. H. V. W.

The Geographical Distribution of Trachoma.

HIRSCHBERG, J. (*Deut. Med. Woch.*, Nos. 27, 28 and 29, 1897), has gathered elaborate statistics from all the provinces of the German Empire, showing the distribution of trachoma and its relative frequency to other eye diseases. Switzerland is mentioned as being practically free from trachoma; the same may be said of the Austrian and German provinces bordering Switzerland on the east and north, though its southern, the Italian border, does not enjoy this immunity. Some parts of southern and middle Germany are free from trachoma, others are only slightly involved, while certain limited districts show greater involvement. In the lower Rhine regions the disease is more widely spread, but still more so in the provinces bordering on Russia, viz.: East and West Prussia (and Pomerania), Posen (and Upper Silesia), in which districts there is a large Slavonic population. H. advises reducing the amount of trachoma by hygienic and medical treatment, and urges the necessity of preventing, to every possible degree, the spread of the disease through the agency of factory, mining, railroad and canal hands. H. V. W.

Magnet Operations.

HIRSCHBERG, J. (*Deut. Med. Woch.*, No. 31, 1897), reports in detail 17 cases in which the sideroscope of Asmus and large and small electro-magnets were successfully used in the detection and removal of iron particles lodged in the eye. The foreign body was lodged in the retina in one case (vision perfect); the lens in three cases (in two of these vision became normal, in one the lens had to be extracted); in two cases the eyeball was so badly injured that, although extraction of the foreign body was successful, enucleation had to follow; in several cases the iron was lodged in the posterior chamber, and in others in the cornea and anterior chamber. Results were excellent in all these cases. In the past two and one-half years H. has used the magnet operation 34 times; only one case, and that before the apparatus now in use was at his command, proving unsuccessful. H. considers the magnet operation, in an experienced hand, a safe procedure, providing a good apparatus be used. H. V. W.

Absence of Pupillary Reaction with Persisting Light Perception.

BRIXA, J. (*Wien. Klin. Woch.*, No. 36, 1897), reports the case of a man who suffered a trauma of the left eye. A foreign body was lodged in the orbit, causing an exophthalmus that was reduced upon removal of the offending particle. The interesting condition was noted that the pupil of the left eye did not react to light, nor could a consensual reaction be obtained in the right eye, but that light perception existed in the left eye, fingers being counted at 30 cm. distance. The media were clear. Ten days later the reflex began to return. One year later the reaction could be elicited in either eye when light was thrown into the other. B. finds in above facts justification for the supposition that there are distinct pupillary and visual fibres in the optic nerve, and that the pupillary fibres are less able to resist trauma than the visual fibres.

H. V. W.

A Contribution to the Ocular Disturbances of Dwarfism and Giantism (Acromegaly).

UHTHOFF, W. (*Berl. Klin. Woch.*, Nos. 22, 23 and 25, 1897), presents the case of a 14-year-old girl with advanced temporal hemianopsia and atrophic discoloration of the papillæ and co-existing thyroid atrophy and retardation of growth since her 9th year. U. localizes the disease in the optic chiasma, the probable cause being an anomaly of the hypophysis cerebri, and quotes experiments of Hofmeister, showing that the removal of the thyroid in young animals is followed by a marked enlargement of the hypophosis cerebri, and also cites numerous observations in literature of the association of thyroid with hypophysis cerebri lesions. U. reports two cases of acromegaly; the first a 16-year-old boy with an universally enlarged body, who had for some time been posing as a giant. The ocular disturbance in this case consists in temporal hemianopsia, with diminution of color field in one eye, and one-sided atrophic discoloration of optic papilla so that the disease is in the chiasma, the hypophysis cerebri being justifiedly looked upon as the cause of the disturbance. Diabetes existed in this case. The second case is one of pronounced acromegaly, in which there existed a marked homonymous, right-sided, color hemianopsia, beginning with involvement of the left side and an a most complete paralysis of convergence. At the autopsy a large tumor (sarcoma) of the hypophysis cerebri was found, involving the optic tract, chiasma, and other basal structures, the greatest extension of the tumor being on the left side. U. thinks that, judging from these and other cases cited in literature, the ocular symptoms in acromegaly should be given much prominence with reference to localization, as well as extent of the intracranial changes. (Temporal hemianopsia was found in over 50 reported cases.)

H. V. W.

Pseudo-Glioma of the Retina.

GREEFF, R. (*Berl. Klin. Woch.*, No. 34, 1897), calls attention to the examination he has made on many enucleated eyes, and to his discovery that, in general, 20 to 25 per cent. of those with diagnosis "glioma" were found to be pseudo-gliomatic. As anatomical points of distinction between glioma and pseudo-glioma he mentions that, while in the former there is a distinct soft tumor mass, the swelling in the latter is seen to be due to an accumulation of a lemon-yellow fluid, usually the result of a choroiditis following upon some infectious disease. In this fluid there are little sparkling particles, cholesterin crystals and fatty and degenerated cells, and on the anterior retinal surface, too, there is a dirty yellow membrane composed of fatty detritus and cholesterin crystals. Later the exudate becomes organized and giant cells may be found. As clinical distinguishing points of pseudo-gliomata are mentioned: 1. The frequent absence of newly formed vessels on the surface of the bulging mass. 2. The tension of the eye in glioma is normal or increased, while in pseudo-glioma it is usually diminished. 3. Retinal glioma is confined exclusively to very young children, usually infants one or two years of age, and after six years almost never occurs, while pseudo-glioma far more frequently occurs at a later age. 4. As additional diagnostic feature the puncture of the sclera and removal of a small particle of the contents for microscopic examination may be performed.

H. V. W.

Osteoplastic Opening of the Orbit in Resection of the First Branch of the Trigeminal Nerve.

CAHEN, F. (*Centralbl. f. Chirugie*, July 10, 1897). Resection or evulsion of the branch of the trigeminus in severe neuralgia is unfortunately attended in most cases with poor results. The neuralgia may return and the only resort be extirpation ganglion of Gasser. In a 52-year-old otherwise healthy man, who had severe right-sided supraorbital neuralgia, which did not yield to internal treatment or to evulsion of the nerve, the author removed the stump of the nerve, cutting through the old scar, chiseling off the upper edge of the orbit, the hard table of the frontal bone and the cells; the dura mater pushed aside and the frontal nerve cut about 3 cm. The wound was tamponed with iodoform gauze, and on the sixth day, as he had no pain, the wound was sewed up and resulted in healing. Four months later the patient had had no pain and the case was considered cured. H. V. W.

ABSTRACTS FROM RECENT FRENCH AND ITALIAN OPHTHALMIC LITERATURE.

By Casey A. Wood, M. D.,

CHICAGO.

ASSISTED BY H. A. BEAUDOUX, M. D., WINONA, MINN., AND
R. A. MACARTHUR, M. D., CHICAGO, ILL.

Quarter Ending October 1, 1897.

Observations on Hydrophthalmus or Infantile Glaucoma.—The Treatment of Ocular Neuralgia.—Bilateral Resection of the Cervical Sympathetic in Exophthalmic Goitre.—Trophic Disturbances in the Eye After Section of the Cervical Sympathetic.—Resection of the Thyroid Gland in Exophthalmic Goitre.—A Case of Goitre Cured by Internal Medication.—Visual Disturbances and Changes in the Fundus Among Miners.—Intermittent Enophthalmus and Exophthalmus.—Ligation of the Carotid in Pulsating Traumatic Exophthalmus.—Cocainization of the Iris.—Study of the Therapeutic Value of the Extract of the Ciliary Body of the Ox.—Epithelioma of the Upper Lid; Blepharoplasty.—Amblyopia Following a Fall Upon the Head.—Use of Holocäin in Ophthalmology.

[From the *Recueil d'Ophtalmologie*, July, 1897-]

Observations on Hydrophthalmus or Infantile Glaucoma.*

Hydrophthalmus or infantile glaucoma is characterized by distension of the globe, with enlargement of the cornea, by increase in the tension and by cupping of the disc. This is due to an obstruction in the channel of excretion either by inflammation or by arrest in the development of the excretory apparatus.

Treatment consists in early operative interference, sclerotomy or iridectomy; the longer the delay the smaller the chance of success.

Hydrophthalmus can be cured by sclerotomy whereas for glaucoma, this operation is only palliative. Iridectomy is dangerous in eyes very much stretched or greatly enlarged, while it is useful in eyes that are very little distended, in the earlier stages of the disease, in which it should be tried if sclerotomy has failed. When the eye has become too large, it is better to do repeated sclerotomies than attempt iridectomy, which may involve loss of the eye. The larger the eye the smaller ought the incision into the globe be, *i. e.*, iridectomy is contra-indicated in enormously distended globes. The earlier the operative interference the better the result; cure even being possible. Medicinal treatment by myotics, iodides, mercury, etc., is useless, offers no chance of cure and wastes valuable time.

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*Etude sur l'hydrophtalmie ou Glaucome infantile. Dr. Geos, (Sau Francisco.) Thèse de Paris, Mars, 1897.

Myotics, however, should not be neglected, and are valuable adjuncts after operation.

The Treatment of Ocular Neuralgia.

In an important and interesting article Markoff* insists upon the treatment of ocular neuralgia.

He divides it into symptomatic and etiological, the latter being connected with the underlying disease. Symptomatic treatment in the great majority of cases is the most important, for we must fix our attention upon the most pronounced symptom, *i. e.*, relieve the pain.

Symptomatic treatment consists in the instillation of a solution of cyanide of potassium, or of quinine. Morphine or cocain do not meet the therapeutical requirements; the former, because whether administered per oram or hypodermically produces a very slight effect, or none at all; the latter, because its effects are so transient. Besides cocain induces an artificial paralysis of the terminal filaments of the nerves, which is regarded as the cause of the neuro-paralytic keratitis.

Cyanide of potassium administered by the instillation of 5 or 6 drops of a one-third to one-half per cent. of luke warm solution, which should be kept in a dark bottle in a cold place. Under these conditions it acts as well as a freshly prepared solution. As soon, however, as it loses its characteristic odor, it is no longer efficacious.

Hydrochloride of quinine is employed as a 1 per cent. neutral solution, for if not prepared without acids it either causes severe smarting or strongly irritates the eye. It is best to combine morphine with the quinine, according to the following formula:

Quin. hydrochlor.	1	gramme.
Morph.	.05	“
Aq.	10	“

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*Vratch, No. 12, 1897.

According to the author no neuralgia can resist one or two instillations. The underlying cause may persist, but the neuralgia itself disappears. Ordinarily after a quarter of an hour if the pain has not subsided, the instillation may be repeated.

It is evident that local treatment is not sufficient to effect a complete cure; general treatment, therefore, preserves its importance.

Finally, as we are occasionally obliged to superintend the preparation of the solution and as this takes some time, we will do well to endeavor to alleviate the pain, according to the conditions by either cold or hot applications.

Bilateral Resection of the Cervical Sympathetic in Exophthalmic Goitre.

The author and his assistant, Mons. Faure, presented this case at a meeting of the Academy of Medicine.*

Personal history: Severe attack of erysipelas at 12; mild attack of typhoid at 21, and a series of attacks of dyspnoea which did not, however, prevent three successful pregnancies. After the birth of the third child, following a violent emotion, when 21 years old, the first symptoms of the disease appeared. Exophthalmus appeared first, followed by palpitation and swelling of the thyroid gland. These symptoms increased during a period of six years; there was but a slight amelioration under the prolonged use of electricity; the goitre appeared to diminish in size. But now she is worse than ever; the lids cannot cover the globes which are very prominent and already the seat of conjunctivitis and keratitis. Her physician, M. Méllié, sent her to me at Saeunec,to have the lids sutured. When she came to me the following conditions were present: Exophthalmus; the eyeballs prominent and almost fixed, were exposed in an unusual degree; conjunctivitis; commencing ulceration of the cornea; complete closure of the lids is impossible and during sleep they remain partially open; field slightly contracted on the temporal side; accommodation and pupillary reflex normal; thyroid very much and uniformly enlarged; arterial pulsations; heart impulse evident on chest wall; each beat imparts an impulse to the thorax; pulse accelerated, 110 to 120 per minute; on the slightest exertion mounts to 150 to 180 per minute and can then scarcely be counted; clearly marked systolic murmur present, the exact nature of which we are unable to determine.

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*Résection bilatéral du grand Sympathetique cervical dans la goitre exophtalmique. M. Paul Reclus, Académie de Mèdicine, Séance du Juin 22, 1897.

In addition to the three classic symptoms, the following other features were present in the case: Tremor of the hands, increased on effort, so that the writing was almost unintelligible; bowing of the legs during walking; fibrillary twitchings of the muscles of the face, especially of the left side and of the forearm; severe trigeminal neuralgia, especially supra-orbital and left temporal; some epigastric spinal and lumbar pains; polyuria; salivation; profuse diarrhoea; loss of hair and eyebrows; sensation of heat in trunk and upper extremities and of cold in lower extremities; insomnia with hallucinations of counting and ascending continually the steps of an imaginary stairs; apathy and hypochondria; general condition pitiable; emaciation; tubercular glands in left side of neck and tuberculosis of apex of lungs.

Such a condition could not persist and resection of the cervical sympathetic was decided on and done in the following way: An incision 12 centimeters in length, was made along the posterior border of the sterno-mastoid; in freeing the muscle, the branch of the spinal accessory nerve to the trapezius was injured and subsequently ruptured. The muscle is turned forward, exposing the vertebral column; further dissection brings to view the nerves of the deep cervical plexus, spread out upon the muscles of the vertebral column. Lying on the anterior surface of the vertebral column is the bundle, consisting of the carotid artery, jugular vein and pneumogastric nerve, which with the sterno-mastoid branch is easily drawn forward, and behind is seen the superior cervical ganglion fixed to the vertebral column by its connection with the deep cervical plexus. The ganglion is seized with toothed forceps and the various branches arising from it are divided. It is then allowed to drop back carrying with it the trunk of the sympathetic. The latter is freed for about 6 centimeters of its length and then the origin of the superior cardiac branches and a plexus which takes the place of the middle cervical ganglion are easily seen. It is below this point that the trunk of the sympathetic is resected as low as possible. No vessels are cut; no ligature is necessary; the skin is sutured with silk worm gut; time of the operation seven minutes.

A similar operation was performed on the left side; the only complication being the presence of the tubercular glands, which were extirpated; time of operation five minutes.

Nothing abnormal was noticed in the pulse, in the face or in the neck at the moment of resection of the sympathetic trunks; the exophthalmus seemed just as prominent and the enlargement of the thyroid just as great. In the evening the pulse was just as fast, but much more regular. Patient had a good night and noticed that for the first time in six years she was able to close the lids over the less prominent eyeballs. The pulse slowly became more regular, but also slower, and the following morning was 100 to 120 per minute.

Improvement continued during the following days; the heart impulse is not so strong, sensation of heat diminished, and the patient is able to sleep several consecutive hours. On the seventh day the dressing is removed; union is complete; the thyroid is much diminished in size and no longer forms the pulsating tumor it did before the operation; pulse 80 to 100 per minute. The general condition is greatly improved. Third week after the operation: Exophthalmus much less pronounced; patient can close the lids completely; goitre is scarcely perceptible; circumference of neck has diminished from 39 to 36 centimeters; no pulsations in the head or neck; heart impulse not communicated to thorax; pulse scarcely rises above 50; tremors, fibrillary twitching of the muscles and bowing of the legs have disappeared; as well as the neuralgia, sweats and diarrhoea. The patient herself feels much stronger and her general condition is certainly very greatly improved.

I do not overlook the leading objection that may be advanced; the result is too recent to draw conclusions from; it will be necessary to see what becomes of the patient, for, to be decisive it must be more than a temporary improvement. It will be interesting to collect the scattered cases on record up to the present, which enable us to draw more precise conclusions than I could do from my unique and too recent case.

Trophic Disturbances In the Eye After Section of the Cervical Sympathetic.

Doyon* presented to the Society of Medical Sciences at its meeting of June 30, a rabbit in which the cervical sympathetic had been resected, in which resection was followed by lesions in the lids and cataract in the eye on the same side. Trophic disturbances following resection of the sympathetic are rare and of varied character. Morat has seen, under these conditions, lesions of the buccal mucous membrane in the dog. The interest attached to the present observation is the new fact of trophic disturbances following section of centrifugal nerves. It is generally admitted that trophic disturbances follow changes in sensory nerves, while, according to Morat, lesions of centrifugal nerves cause them. The trophic disturbances which are observed after section of the posterior roots would seem to be against this view, but Morat has shown that they contain some centrifugal as well as centripital fibers.

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*Doyon. Bulletin Médical de Lyons, Juin, 1897.

Clinically, trophic disturbances in the eye are attributed to changes in the trigeminus and sympathetic; this destruction, however, has no great pathological significance; the trigeminus has numerous sympathetic filaments, arising partly from the cervical sympathetic and partly from the trunk of the trigeminus and passing through the gasserian ganglion.

Resection of the Thyroid Gland in Exophthalmic Goitre.

Lejas* instances the case of a young girl, 18½ years old, suffering from an exophthalmic goitre of about eight months standing, in whom a successful resection of the right lobe of the thyroid gland was performed. The same night the patient was seized with intense dyspnoea and died in a quarter of an hour. Nothing abnormal, except a very large thymus gland, was found at the autopsy.

Quéur, two years ago, successfully removed the whole thyroid gland for exophthalmic goitre. Three weeks after the operation myxedema supervened, which was cured by the administration of thyroid extract.

Tillaeux distinguishes goiters without intra-thyroidean tumors, in which no operation should be performed, four goiters in which the symptoms are due to tumor of the thyroid gland, acting by pressure on the arteries, veins and nerves of the neck. The removal of these tumors is indicated because it is enough to bring about a cure, without exposing the patient to the dangers consequent upon total thyroidectomy, because in the removal of the tumor the greater part of the thyroid is preserved.

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*Lejas. Resection du corps Thyroide dans le goitre Exophtalmique. Société de Chirurgie. Seance du 10 Février, 1897.

A Case of Goiter Cured By Internal Medication.*

A woman about 40 years old, had a goiter of long standing. She had been treated in Germany by Prof. Lossen, by means of injections of alcohol, but the tumor did not completely disappear; it even increased in size at intervals. The author treated it by iodothyrine for two months, and the goiter disappeared almost entirely.

Visual Disturbances and Changes in the Fundus Among Miners.

This is a most instructive, exhaustive and interesting work. It is the result of observations extending over thirty years by one who has had very considerable experience in diseases peculiar to miners.†

The author has observed 100 cases of diseases of the eye and has tabulated them as follows:

Congestion of one papilla or more often of both	48.
Atrophy of the nerve	23.
Atrophy on one side, congestion on the other	18.
Choroidal atrophy	8.
Anemia of the retina	2.
Hemorrhage of the retina	1.

According to the author, the principal cause of these affections is the intoxication by coal gas, which accumulates in the shafts, tunnels and galleries on account of the defective ventilation. Nystagmus, epiphora and simple conjunctivitis have been observed, as well as accommodative asthenopia, which the poor light has helped to produce and increase.

The following remedies have been used: Arseniate of iron, arseniate of sodium (2 to 10 milligrammes per day), to which he gives the preference, cod liver oil in winter, and phosphide of zinc, which has given, in his hands, no results. The remedy, however, *par excellence*, is iodide of potassium, which really seems to be a specific: dose, .75 to 4 grammes per day. Purgation and friction of the skin, either dry or with lotions, have seemed to be of service.

The following conclusions are reached:

1. Miners are subject to certain disturbances of vision which are attributable to their calling.

2. These disturbances are due to malnutrition, caused

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*C. Bernays. The International Journal of Surgery, May, 1897.

†Troubles de la vision et modification du fond de l'oèil Chez les Mineurs. Dr. Bourguet, Paris, 1896.

by a condition of the blood brought about by poisoning by the gas.

3. They are susceptible of improvement, if not of cure, by suitable treatment, the most important element in which is the administration of iodide of potassium.

Intermittent Enophthalmus and Exophthalmus.

The following case is reported by Moyart:[*] A young girl, 18 years old, a factory hand, suffered for two years from painful exophthalmus on every exertion. The trouble was attributed to the severe rubbing of a sty by a gold ring and began two or three days thereafter. In February last, the patient presented the following conditions: Slight enophthalmus; exophthalmus on the slightest effort, especially stooping, when the eyeball projected four millimetres; diplopia; myosis; ptosis; amblyopia; sharp, penetrating pain over left temple. On lying down the eye resumed its normal position in fifteen seconds, and vision, though somewhat indistinct, returned in five or seven seconds after cessation of the effort causing the amblyopia. Compression replaced the eye in two or three seconds and soon restored vision. Ophthalmoscopic and auscultatory examination, both during rest and periods of exertion, gave negative results. By the middle of April conditions had improved; exophthalmus is produced more slowly on effort, and especially on compression of the jugular veins; pain is less severe and is situated at present at the back of the orbit.

Ligation of the Carotid in Pulsating Traumatic Exophthalmus.

Schimanowsky[†] reports a case of pulsating exophthalmus occurring in a woman about 52 years old, six weeks after a fall. Three months after the accident the following conditions were found: Exophthalmus of the left eye; pulsations in globe synchronous with the heart beats; displacement of the eye down and out.

The left carotid was ligated; immediately thereafter the pulsations in the orbit ceased and the exophthalmus diminished. An hour after feeble pulsations reappeared in the superior internal angle; and two days after, when changing the dressings, at the site of the wound a tumor was noticed, due, no doubt, to hemorrhage from a small vein accidently wounded during the operation. The condition of the eye continued to improve; however, at the end of six weeks the exophthalmus had returned to the condition in which it was previous to the operation. Ultimately the haematoma in the neck disappeared and the exophthlamus diminished somewhat.

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[*] Enophtalmie et exophtalmie intermittente. Moyart. Bulletin de la Société Belge d'ophtalmologie.

[†] Ligature de la carotide dans l'exophtalmie pulsatile traumatique. Schimanowsky. Revue de Thérapeutique, 15 Juin., 1897.

Cocainization of the Iris.

To produce anesthesia of the iris in operations upon it, Roudine[*] recommends subconjunctival injections close to the border of the iris where the incision is to be made. Three or four divisions of a Piroatz syringe of a 5 per cent. solution are used. It is to be distinctly understood that the subconjunctival injection, which is given immediately before the operation, does not dispense with the usual instillation of cocain into the eye. Immediately after the injection the eyeball is gently massaged, especially over the cornea.

Roudine enumerates twelve cases of iridectomy performed under these conditions: Of these, in one only was the iris sensitive; in six anaesthesia was complete; and in the remaining five the sensibility was very considerably dulled.

Study of the Therapeutic Value of Extract of the Ciliary Body of the Ox.

The elder Dor[†] found that a serious sympathetic ophthalmia was considerably improved by injections of extract of the ciliary body of the ox. The author's theory is as follows: Normal aqueous humor contains no albumen, whereas aqueous humor altered by pathological changes in the eye does contain albumen. There must be some substance normally present in the ciliary body capable of retaining the albumen within it, which must disappear in certain affections, and which Dor proposes to restore by extracting it from the eyes of animals and introducing into the affected eyes.

Epithelioma of the Upper Lid—Blepharoplasty.

ULRY AND CABANNES (*Journal d Med. de Bordeaux*) presented to the Society of Anatomy a patient who had been operated on for blepharoplasty by Prof. Badal. The patient, aged 60, had been admitted at St. André's Ophthalmological Clinic on Jan. 5th for an epithelioma of the right upper lid.

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[*] Cocäinization de l'iris. Revue Russe d'ophtalmologie. Nos. 11 et 12, 1896.

[†] Dor. Essais de Thérapeutique ophtalmologique avec l'extrait de corps cilaire de boef. *Congrès Francais d' ophtalmologie*. Mai. 1897.

His trouble dated back, at that time, about one year and a half, but no surgical interference had been allowed until Jan. 8th, when, under chloroform anesthesia, the greater part of the integument of the lid was removed with two-thirds of the external ciliary border. The tarsal cartilage scrupulously curetted was saved. A triangular temporo-frontal flap was twisted upon its base and fitted to the lid. Union by first intention was the result and with the exception of one or two suppurating sutures the result is most satisfactory.

Amblyopia Following a Fall Upon the Head.

Cabannes and Ulry brought before the Society of Anatomy and Physiology of Bordeaux a case of this kind from Prof. Badal's service.

D——, age 32, sailor, was thrown, on the 22d of Jan., from a foot-bridge upon the deck of his ship, a distance of about 6 feet; his cranium striking violently against the resisting wood work. After a quarter of an hour of unconsciousness a large sanguinous bump appears in his left parietal region; his mouth remains open on account of a partial subluxation of left temporo-maxillary articulation, and palpebral and sub-conjunctival ecchymosis is quite noticeable.

The patient tells that after having recovered consciousness his left naris bled freely and that he even spat blood. On closing the right eye he was unable to see. This abolition of vision lasted eight days, when he was able to distinguish daylight, then recognized the shadows of passing objects.

An examination made on the 17th of Feb. of the same year, 1897, shows almost a total disappearance of the palpebral and sub-conjunctival ecchymosis; the cornea transparent; the anterior chamber normal. The iris slightly dilated responds feebly to light. There is neither, cataract nor exudate to be found in the pupil. The levator palpebrum, the orbicularis and all the movements of the globe are normal in function.

On exploring the orbital wall two small bony projections can be felt, one at the external angle, the other overlooking a small depression of the inferior border situated at about two centimeters from the inner angle. Neither pressure or percussion of these projections or of any of the facial bones cause pain. When the patient fixes with his left eye his look is directed higher than the object looked at, showing that he does not fix with the macula.

The visual field of this eye is greatly narrowed down, the external superior quadrant extends hardly beyond 20°; the internal inferior quadrant alone being normal. The field of the right eye is normal in all parts. An ophthalmoscopic examination reveals no lesion to explain the trouble in the left eye, the papilla is somewhat pale and the veins are slightly dilated. All the reflexes are normal, except as already remarked, the left pupillary.

The cutaneous reflex is normal everywhere except over a small area limited inferiorly by the lower lip inwardly by the crest of the nose, outwardly by a line drawn from the external canthus to the corner of the mouth. In this region which corresponds to that supplied by the infra-orbital nerve, the sensation for such stimuli as cold, heat, touch, etc., is abolished. The study of this case is interesting from the fact that the diagnosis is by no means easy. "We, however, believe," say the authors, "that we are dealing with a case of pressure upon the optic and infra-orbital nerves caused by an hematoma originating from a fracture in the floor of the orbit."

Use of Holocäin in Ophthalmology.

The honor of the discovery of holocäin belongs to Tauber, instructor in chemistry in the Polytechnic Institute of Berlin. Its chemical composition gives us the following formula:

$$CH_3C \left\{ \begin{array}{l} Az - C_6H_4OC_2H_5 \\ AzH - C_6H_4OC_2H_3 \end{array} \right.$$

We have used the chlorhydrate of holocäin (P diethoxy diphenylethenyldiamine) whose local anesthetic action was noticed by R. Heinz (of Jéna) and more specially in ocular therapeutics by Hirschberg, Kuthe and Gutmann (of Berlin) and Deneffe and Claeys (of Gand). This salt is little soluble in cold water but dissolves easily in warm water.

We should bear in mind, however, that the ebullition of the chlorhydrate of holocäin can only take place in porcelain vessels or in those made of glass having been first boiled in chlorhydric acid; if this precaution were neglected the alkaline substance of the glass would, in part, be dissolved and would precipitate the holocäin. The chlorhydrate of holocäin presents in itself germicidal action, therefore its association with any antiseptic with a view of preserving the solution aseptic is useless.

We have used in our clinical researches (the first made in France) solutions of $\frac{1}{4}$, $\frac{1}{2}$, and 1 per cent. of chlorhydrate of holocäin. From two to four drops of a weak solution ($\frac{1}{4}$ to $\frac{1}{2}$ per cent.) instilled into the conjunctival sac have been sufficient to allow cauterizations to be made on the conjunctiva without pain, or to arrest the blepharospasm in anterior diseases of the eyeball.

As for operations, we have found that the most practical method is that of Deneffe and Claeys; it consists in the instillation of one drop of 1 per cent. solution, followed after a minute by a second drop.

The 1 per cent. solution produces a slight irritation of which the patients did not complain while few others accustomed to other drugs have felt nothing; an hysterical patient alone complained of severe pain. Twenty-five or thirty seconds after the instillation of holocäin, the conjunctiva (and a little later the cornea) becomes insensible at first to the touch and afterward to the actions of heated chemically irritating substances.

The transition between the state where the thermal sensation is still felt without the patient being conscious of its condition (hot or cold) and that where the thermal sensation of the conjunctiva is completely abolished takes place so quickly in holocäin anesthesia that the period of action of this drug (very short in cocäin anesthesia), where, however, its duration is longer, may very easily escape the observer.

Anesthesia produced by holocäin develops not only more quickly than that produced by cocäin, in the eye, (with the 2 per cent. solution), but it persists much longer (eighteen to twenty minutes), and has an intensity at least equal. The conjunctiva becomes at first again sensible to thermal irritations and then only to the touch. The sensibility is obtuse from two to three minutes.

One can even notice after the return of sensibility that when the holocäinized eye is touched with copper sulphate a certain hypoalgesia is manifested if the other eye is tested in the same way.

During the action of holocäin we have not been able to discern (except in exceptional cases where a very light hyperemia was manifested), any abnormal symptoms, no enlargement of the palpebral fissure, no diminution in the frequency of winking, no alteration in pupillary diameter, no luminous sensations or reactions, no exaggerated flow of secretions in the eye.

Holocäin acts in the same manner in contact with a hyperemic or granular conjunctiva as in the presence of a normal conjunctiva. In a patient, however, who had contracted in Egypt a grave trachoma the insensibility of the cornea took place slowly and only lasted fifteen minutes. From the writings of Heinz we see that the toxic dose of holocäin is one centigramme, for cocain five centigrammes, for eucain seventy-five milligrammes. Among these three local anesthetics of the eye eucain is therefore the least toxic, holocäin the most.

In spite of the great toxic action of holocäin we have never, even with children, observed the least objectionable symptom; we have used this anesthetic for several operations in trachoma, to remove calcareous deposits in the conjunctiva or foreign bodies in the cornea and for subconjunctival injections, etc.

We believe that intoxication with holocäin following local anesthesia in the eye is little to be feared. However a certain amount of prudence in its use is always recommended especially with children.

The quantity of holocäin used in most cases is rarely more than two drops of 1 per cent. solution; even if two drops were swallowed the patient could absorb only one milligramme of the drug, *i. e.*, one-tenth of the toxic dose.

The objection might arise that cocain, the toxic dose of which is five times smaller than that of holocäin, used as a collyria in 4 per cent. solution, has produced at times toxic symptoms in adults. Admitting even that during cocain anesthesia, five to ten drops of such solution instilled in the eye had been swallowed by the patient—and in this case one would have to consider the true abuse of cocain as an anesthetic in the eye—the patient would have absorbed one to two centigrammes of cocain, such dose in no way toxic. We, therefore, believe that it would be best to interpret the symptoms described above (pallor of the face, syncope, etc.) as those provoked by the apprehension before the operation.

Heinz has carefully studied the symptoms of intoxication by holocäin upon animals, the analogy which they present is very similar to that observed in intoxication by strychnia: trismus, opisthotonos, cramps in the extremities and the arrest of respiration following temporary pauses.

Certain similar symptoms have been noticed in eucain intoxication; they have been studied with the most accurate care by Ver Eecke (of Gaud) (see the interesting report of Prof. Nuel upon this work read before the Royal Academy of Medicine of Belgium, 1897, session of May 29) in his experiments made upon animals.

No bad symptoms have arisen from the use of hypodermic injections of eucain in the numerous cases for which it has been used, not even in children.

Experiments made upon animals have demonstrated that the toxic properties are less for eucain than for cocain, and such is confirmed by our clinical experience.

Ver Eecke states that toxic doses of chlorhydrate of eucain terminate by paralysing the respiratory center. This paralysis is not the direct effect of eucain but rather provoked by the asphyxia due to eucain convulsions. The antidotes used in the case of holocäin are those of strychnia: morphia, chloralhydrate, and the bromides; inhalations of chloroform may be useful and in desperate cases artificial respiration. Hydrate of chloral is equally indicated in eucain intoxication. Ver Eecke has noticed that antagonism exists between the action of chloral hydrate and that of eucain chlorhydrate. Intra-venous injections of chloral hydrate suppress very rapidly eucain convulsions. Simultaneous injections of chloral hydrate and eucain in convulsive doses prevent the production of convulsions. The administration of chloral to animals allows eucain to be given in doses much larger than the fatal dose. The antagonism between chloral hydrate and eucain is, so says Ver Eecke, physiological and not chemical; this antagonism is not reciprocal.

As for the local action upon the eyeball there is still another difference worthy of notice between cocain and holocäin which may have escaped all the authors who have experimented with the latter. If a drop of cocain is instilled in the eye, mixed with pilocarpin or eserin we obtain a myosis stronger than without cocain. The mydriasis of atropia is also much greater when cocain is used in conjunction. The influence of holocäin used with a mydriatic or a myotic is in no way similar and does not increase the action of one or the other.

Cocain produces a dryness of the cornea and a shrinkage of the epithelial cells. This produces gaps in the epithelial layer, and favors the absorption by way of the lymphatics and intralamellar tissues, of a second collyria into the anterior chamber.

The gaps favor also the entrance of pyogenic microbes into the eye.

A part which seems to favor this opinion is that while treating specific conjunctivitis abcesses are much more frequent when cocain has been instilled before the treatment began. Holocäin on the contrary produces no dryness of the cornea, no disturbance of the epithelial layer, opens no passage for microbes into the corneal tissues, or increase myosis and mydriasis.

Holocäin while presenting the same local anesthetic advantages in the eye, has none of its disadvantges or dangers. The great toxic dangers of holocäin will not permit it to displace totally the use of cocain. But all three holocäin, eucain and cocain will have special indications and usage in ocular theurapeutics.

The vaso-constricting action of cocain is advantageous in operations upon vascular tissues, but harmful in those performed upon the cornea, because of the peculiar way in which it takes nourishment. In debilitated patients the continued, although well regulated use of cocain, has brought on corneal troubles.

Mellinger in his experiments made upon animals has proven that cocain retards the healing of corneal abrasions. And it is because of this that we have advised the use of eucain mixed with cocain in operations performed upon the anterior portion of the globe.

We have no pretention in this latter formula to ameliorate the anesthesia of the eye, but only to use means which in giving us this result interfere in no way with the corneal disease.

Briefly let us give the indications for the use of eucain, holocäin, and cocain in ophthalmology.

Holocäin is indicated in all operations performed upon the anterior portion of the eye, and in all cases where the patient must use his eye after the ocular anesthesia has been induced.

Cocain is indicated where anesthesia is to be obtained by means of injections. In treating children or feeble patients it is well to use a mixture of eucain and cocain to avoid toxic symptoms. Eucain associated with cocain, according to our formula (chlorhydrate of cocain and chlorhydrate of eucaine 10 centigrammes, aqua destil 10 grammes), or according to Deneffe and Claeys:

℞.—	Chlorhydrate of eucain, - - -	5 gr.
	Chlorhydrate of cocain, - - -	5 gr.
	Aqua destil. - - - - - - -	5 gr.

is indicated in operations upon the cornea and in all cases where bad results might occur because of the vaso-constricting of the cocain.

ABSTRACTS FROM CURRENT AMERICAN AND ENGLISH OPHTHLMOLOGICAL LITERATURE.

By Charles H. May, M. D.,

NEW YORK.

Contagious Conjunctivitis.

Standish, Miles, M. D., of Boston, Mass. *(Boston Med. and Surg. Journal*, Aug. 5, 1897.)

The writer mentions the subdivisions of purulent or blenorrhoeal conjunctivitis: (1) acute catarrhal, (2) ophthalmia neonotorum, (3) gonorrheal, (4) diphtheritic. He summarizes the clinical picture under each head giving the descriptions which have been classical for years past. He contends that in the light of modern bacterilogy these descriptions must be modified and a new nomenclature which follows the bacteriological findings be adopted. With the assistance of Dr. William Daly he has been investigating all acute cases of conjunctivitis occurring during his last two services at the Mass. Char. Eye and Ear Infirmary and the paper is the summary of these results. He found that the disease known as acute catarrhal conjunctivitis is often produced by a bacillus but that it may also arise from an infection with the pneumococcus, staphylococcus, streptococcus and probably other micro-organisms not excluding mild infection with the gonococcus. In one case a purulent conjunctivitis originating within the first week of life was due to an infection with Klebs-Löffler's bacilli. Those cases of ophthalmia neonatorum which run a destructive course were due to infection with gonococci while the lighter cases have proved to be due to an infection with pneumococci.

"In cases which present the clinical pictures of diphtheritic and gonorrheal conjunctivitis, experience has proved that bacteriological examinations are of the very greatest value, for in many cases, which from clinical pictures we have supposed to be gonorrheal, are, in reality, diphtheritic and the reverse is also true to some extent, as I have seen brawny and infiltrated lids, dense infiltration of the bulbar conjunctiva with a necrotic condition of the cornea and very slight, if any, purulent discharge, which upon bacteriological investigation proved to be infections from gonococci.

"From the standpoint of therapeutics it is of the greatest importance that a proper bacteriological diagnosis should be made in these cases and that from this examination the line of treatment should be decided and not from the clinical appearance of the eye. The importance of this early diagnosis is, to my mind, due to the fact that in gonorrheal ophthalmia nitrate of silver is the only application which ever controls the disease, while in diptheritic conjunctivitis I consider that nitrate of silver hastens the destructive process which is taking place in the corneal tissue. Conversely, it is my opinion that the diphtheritc condition of the conjunctiva and consequent necrosis of the cornea will generally be controlled by prompt and persistent use of antitoxin.

"After these infections of the conjunctiva, the next most dangerous form of contagious conjunctivitis is the so-called granular lids or trachoma; if this is of bacteriological origin the micro-organism has not as yet been recognized, nevertheless it will spread slowly through an orphan asylum, tenement house, or any other place where the poor are crowded together, unless special means are taken to prevent this result, leaving its victims handicapped for life and often nearly blind. Fortunately it is diminishing in this country and is, compared with a few years ago, seldom seen except among recent immigrants from the eastern end of the Mediterranean, Polish and Russian Jews, Armenians and others from that locality, and I may say in passing that the presence of acute trachoma in the conjunctiva of immigrants should oe a good and sufficient reason for turning them back whence they came. A large portion of these cases within a few months after their arrival became incapacitated and are public charges. And not only this, but were it not for the new cases thus introduced into the great tenement localitities of our large cities, it is my opinion that the disease would soon become extremely rare in this part of the country.

"From my experience in cases of purulent conjunctivitis and trachoma, I arrive at the following conclusions: (1) That in all cases of purulent conjunctivitis, the diagnosis should be made by the bacteriological examination and not from the clinical picture. (2) That in the two most dangerous diseases of this class, namely, gonorrheal conjunctivitis and diphtheritic conjunctivitis, a favorable outcome of the case depends upon a correct diagnosis, as proper treatment in one disease is of no benefit in the other and may even do harm. (3) That in cases of ophthalmia neonatorum a bacteriological diagnosis is as important as in other cases of purulent conjunctivitis, and if such were made early and prompt treatment instituted, many a child would be saved from blindness. (4) That in every case in which a parturient woman has a leucorrhea, if it is not convenient to bacteriologically determine the cause before the birth of the child, Crede's method should invariably be employed. (5) Immigrants with acute trachoma should not be admitted to this country."

Purulent Ophthalmia From the Bacteriological Standpoint.

DALY, WILLIAM J., M. D., of Boston, Mass. (*Boston Med. and Surg. Journal*, Aug. 5, '97.)

The writer calls attention to the importance of an early bacteriological examination in purulent conditions of the conjunctiva since the clinical picture in such cases is frequently of no value in determining the etiological factor. He points out that it is sometimes absolutely impossible to distinguish clinically in the beginning between

Acute contagious conjunctivitis,
Diphtheritic conjunctivitis,
Pneumococcus conjunctivitis,
Membranous conjunctivitis, not due to the presence of the Klebs-Loeffler bacillus.

He claims that another class of cases in which there is a purulent discharge and in which the differential diagnosis is difficult without a microscopical examination is that observed in infants met with most frequently in the dispensary service of large hospitals. Here it is sometimes difficult to make a differential diagnosis between:

Gonorrheal ophthalmia,
Tear-sac disease from pneumococcus infection, and
Acute contagious conjunctivitis (rarer).

The writer gives the technique of the two forms of bacteriological examination attendant upon a successful diagnosis in these cases—by smear and by culture media—and describes what is seen under the microscope in each case. Regarding acute contagious conjunctivitis, the bacillus described by Dr. Weeks was found in a few cases, but the vast majority showed the presence of the commoner pyogenic organisms, namely, staphylococci, streptococci, and a few others the bacillus xerosis and the bacillus pyocyaneous.

Incidentally, during the course of these investigations, the writer made a large number of cultures from the conjunctivæ of healthy individuals who exhibited no ocular trouble, and in over fifty per cent. of cases, contrary to what has been reported recently by a number of German observers, the tubes showed absolutely no growth.

Diphtheritic Conjunctivitis.

Standish, Miles, M. D., of Boston, Mass. (*Ophthalmic Review*, May, 1897.)

The writer refers to a paper read in '96 on the importance of having a bacteriological diagnosis in cases of diphtheritic conjunctivitis. "The principle brought out was that there were many cases of this disease which did not follow the classical clinical picture that we have called diphtheritic conjunctivitis, and consequently many more destructive processes were diphtheritic than we had hitherto been led to suppose. Since writing that paper I have felt much more strongly than formerly the importance of having an early bacteriological diagnosis, for the reason that in my experience in these cases, if they are treated early with antitoxin, they run a much milder course and the cornea is generally saved, with resulting preservation of vision. Moreover, I have come to regard with suspicion rapidly progressing infiltrations of the cornea, unassociated with any very strongly marked conjunctivitis, for, upon bacteriological examination in such cases, I have several times found that the pathological process was due to an infection with Klebs-Loeffler's bacillus."

The author reports three cases selected from a number which he had seen during the past year. The first illustrated the benefit to be received from an early and persistent use of antitoxin in a typical case of diphtheritic conjunctivitis. The second illustrated a diphtheritic infection in which the conjunctival disturbance was comparatively slight, and the corneal disturbance rapid and severe with destructive ulceration. The third case presented very much the typical picture of diphtheritic conjunctivitis, yet shreds taken from the conjunctival sac revealed gonococci and no Klebs-Loeffler's bacilli.

From these cases and others which he has seen during the past year, the writer arrives at the following conclusions:

"(1) In all cases of purulent conjunctivitis, the diagnosis should depend upon the bacteriological investigations, and not upon the clinical appearance.

"(2) That diphtheritic conjunctivitis may be present in localised areas without the conjunctiva being affected as a whole.

"(3) That ulcers of the cornea with exceedingly rapid necrosis of the corneal tissue may be due to infection with the Klebs-Loeffler bacillus.

"(4) That antitoxin favorably affects both the conjunctival disease and the corneal necrosis."

Experimental Studies on the Extension of Fluids Injected Beneath the Conjunctiva.

DRS. CARL MELLINGER AND DOMENICO BOSSALINO, of Basle. (*Archives of Ophthalm.*, July, 1897.)

The authors endeavored to answer the question whether fluids injected beneath the conjunctiva remained limited to the anterior portion of the eyeball or whether they found their way to more remote parts of the globe. They experimented upon white rabbits, using emulsions of India ink as injecting material. The ink passed from the limbus of the cornea both into the lids and into the posterior portion of the eye and well along the optic nerve; a small amount of the ink actually entered the eyeball. The experiments led them to the conclusion that "sub-conjunctivally injected fluids, following the greater lymph spaces, surround the entire globe." The authors add: "So far as communication with the interior of the eye is concerned, our experiments confirm the views expressed by Deutschman and other observers. We are, therefore, inclined to believe that fluids injected beneath the conjunctiva not only surround the eye and optic nerve, but additionally by paths of communication can communicate with the supra-choroidal and inter-vaginal spaces of the optic nerve."

Bacteria in the Normal Conjunctiva and the Effect upon Them of Aseptic and Antiseptic Irrigations. The Staphylococcus Epidermidis Albus (Welch) a Regular Inhabitant of the Normal Conjunctiva.

RANDOLPH, ROBERT L., M. D., of Baltimore, Md. (*Archives of Ophthalm.*, July, 1897.)

The writer made a series of experiments upon one hundred persons with normal conjunctivæ taking some of the conjunctival secretion and making inoculations upon nutrient agar before and after irrigations with sterilized water and with sublimate solution. His conclusions are:

(1) The normal conjunctiva always contains bacteria. Of these the staphylococcus epidermidis albus is found with such frequency that it must be regarded as a regular inhabitant of this situation. This coccus and probably other bacteria found in this locality are usually of only slight if any pathogenic power. It should be remembered, though, that bacteria ordinarily non-pathogenic, may become harmful under certain favoring conditions, such as bruising of the tissues by instruments or the irritation resulting from chemical substances.

(2) Neither the irrigation with sterilized water nor instillation of a sublimate solution (1:5000) produces sterility of the conjunctiva, and inasmuch as both measures are futile and possibly harmful they may just as well be abandoned. These methods of sterilizing the conjunctiva are the ones usually employed by ophthalmologists, and hence the choice of them for testing this question. The most important essential of a germicide which is to be used upon the conjunctiva is that it be absolutely free of irritating properties, and furthermore, it should be demonstrable that this germicide will destroy the germs most commonly met with in the normal conjunctiva. It goes without saying that an antiseptic which has these qualities would be indispensible in all operations on the eye.

(3) In operating upon the normal conjunctiva, as in cataract operations, the surgeon in the present state of our disinfecting armamentarium would do well to consider the subject of antisepsis and asepsis chiefly, if not solely, in connection with the hands, instruments, cocain, and atropin.

The Treatment of Lacrymal Obstruction by Styles.

MILLER, R. SHALDERS, F. R. C. S. E., of Windsor, England. (*The Lancet*, July 2. 1897.)

The writer calls attention to the fact that the treatment of this condition has been less successful than the operative treatment of other ocular disorders. Since 1877, he has been treating all organic strictures of the lacrymal duct —that is, all parts of the outfall from the lower punctum lacrymal to the exit in the inferior turbinate sinus of the nose—by styles, in most cases permanently retained.

"Except for temporary wear they should be made of fine platinum wire, about 25 gauge, and I always make them myself for each individual case. The shape, direction and length of the nasal duct being variable this special adaptation is the key to success in the use of styles, which consist of a vertical stem with a short arm bent at or about a right angle to the stem and usually this arm is made double by recurving the wire back to the stem, so that the arm consists of two thicknesses of wire, parallel and quite close together, the recurved part being vertically beneath the other, or upper part, In this way the slit in the edge of the lid is just filled up, but no metal is visible unless the lid be everted. Sometimes the furrow produced by slitting up the canaliculus is very shallow; then the arm of the style is single. The length of the arm should be such that it easily fills the slit up canaliculus; it should not be tight. The stem should always be long enough to project through the lower opening of the duct in the inferior nasal sinus.

The practical effect of a style in maintaining the patency of the lacrymal exit depends upon the lateral movements of the lower lid, imparted by those long, straight muscular fibres which take origin at the tendo palpebrarum and run horizontally outward to the surface of the malar bone and are automatically quite separable from the oval bundles of orbicularis proper. The tubular styles of the instrument makers are worse than useless; they soon become choked with mucus and dust. Also in the case of the grooved styles the necessarily thin edges of the groove cause irritation and the production of a granulation which stops the way. The stem should not be straight, except in the case of a very short duct, but somewhat concave outward. The lower opening of the duct may be obstructed by a lower turbinate excessively curved toward the outer nasal wall, but even this is scarcely an excuse for turbinotomy.

I have found no difficulty in pushing a tube through the turbinate bone, and the style, made long, follows suit. Some of my patients have worn a platinum style for eight or more years without its ever having been removed from the moment of its first introduction. In every case of lachrymal abscess a style ought to be used—for a time at least—and in most instances is needed permanently; but a temporary one must be first introduced, of a form modified according to the amount of swelling in the part.

Such styles may be of lead or silver, and several different forms and sizes are sometimes desirable in succession to suit the changing size and shape of the lid and canthus. I have once found it necessary to make an eyed probe of lead wire, pass it through the duct and anterior naris, and, by means of a thread attached, pull a fine drainage tube through and thus restore a lacrymal passage which had been obliterated by an encysted abscess for sixteen years. A platinum style was afterward worn with a perfect result.

In the little operation preliminary to the insertion of a style the chief obstacle likely to be met with is the spur or projecting angle formed by the lower boundary of the conjoint opening of the canaliculi and the adjacent part of the lacrymal sac—that is to say, the outer wall of the sac below the opening of the canaliculi. The lower canaliculus is slit up with either a Stilling's or a Weber's knife. The latter sometimes finds its way more easily, but as a rule I use a Stilling's knife throughout. This traverses the canaliculus easily, and yet is strong enough at the base to be safe from breakage. A Weber's knife should never be passed down the duct; the blade is apt to stay there, of which mishap several examples have come to my knowledge. The canaliculus being slit up, the Stilling's knife is passed down the duct in the ordinary way, and in withdrawing is rotated till the edge of the blade looks directly outward and the handle is inclined toward the external angular process of the orbit so as to bring the edge of the knife firmly against the above mentioned spur which is divided in drawing out the knife. A Couper's probe, about size 5 or 6, is then pased and allowed to stand for a minute or two, and the length of the part introduced is noted when the probe is withdrawn. The stem of the style should generally be about an eighth of an inch shorter than such a measurement. It might be supposed that the division of the spur would cause hemorrhage into the sub-palpebral tissues. This rarely happens, and when it does nothing more than a "black eye" ensues, and this can be reduced to almost nothing by tying up the eye with a pad kept wet with hazeline for a few hours. Styles are, of course, not needed in cases of temporary lacrymal obstruction, such as acute catarrh of the sac and comparatively recent mucocele, or in some obstructive conditions resulting from nasal disease. Irrigation with mild antiseptic fluids should have a fair trial before adopting any operative measure, except in lacrymal abscess. The repeated passing of probes is highly objectionable, and styles made of improper materials are perhaps worse.

The movement of the tears toward the inferior turbinate sinus is initiated by the capillary effect of the canaliculi, and by the action of the tensor tarsi muscle, and is continued by the ciliated epithelium which lines the sac and *ductus ad nasum*. But capillarity is not an attribute peculiar to cylindrical tubes; it occurs equally well between plain surfaces, as every worker with the microscope is aware, and a properly slit canaliculus is not a yawning chasm but a neat cleft with flat parallel surfaces in contact with each other and when a well fitting style is *in situ* capillary attraction goes on readily between the style and the inner surfaces of the furrow containing it."

Traumatic Prolapse of the Iris and Its Treatment.

DE SCHWEINITZ, G. E., M. D. of Philadelphia, Pa. (*The Medical News*, July 3, 1897.)

The writer's paper includes the histories of many cases illustrating the points which he makes. His remarks formed the basis of discussion at the April meeting of the Ophthalmic Section of the New York Academy of Medicine.

"Evidently no single rule of surgical conduct is applicable to each case of traumatic prolapse of the iris, and for the sake of convenience, as well as for therapeutic consideration, these lesions may be considered from the regional standpoint, *i. e.:*

I. *Cases of Prolapse of the Iris Through Wounds at or near the Corneo-scleral Junction, Forming the Well-known Pouch-like Hernia.* If seen early, that is before the anterior chamber has been reformed, owing to closure of the wound by adhesive inflammation, three courses are open to the surgeon:

1. Replacement of the prolapsed iris and the management of the case in the ordinary manner, with pressure, bandage, and rest; or, in the event of failure:

2. Abscission of the prolapsed iris, precisely as in the operation of iridectomy.

If either after replacement or abscission the wound shows a tendency to gape, or is not neatly coapted, and hence the danger of reprolapse is rendered likely, the wound may be closed with one or more delicate silk sutures.

3. Compressive bandage, rest, etc., without manipulation or abscission of the iris.

Although the advice to replace the prolapsed iris, if possible, is always given, and properly so, in point of fact the opportunities to accomplish this manoeuver successfully are comparatively rare, and hence practically the choice lies between an operative and non-operative procedure.

Eyes with this lesion treated without surgical interference, and which heal without infective inflammation, present an adherent peripheral leucoma and an oval, mobile pupil, and have good vision. Sometimes, indeed frequently, healing proceeds without signs of reaction; at other times there is iritic and ciliary irritation, and, withal, the nuisance of prolonged bandaging and protracted convalescence.

Eyes with this lesion successfully treated by abscission, with or without a stitch, according to the indications, heal with comparatively little scar, and present a narrow keyhole-shaped, mobile pupil and non-adherent iris. The time required for cure, as compared with cases treated upon conservative principles, is short. I cannot understand what advantage, under these circumstances, a non-operative treatment would possess.

If the case is seen late—that is, after the anterior chamber has been reformed, owing to the closure of the wound by adhesive inflammation—two courses are open to the surgeon: *(a)* Compressive bandage, etc., *i. e.*, non-operative, or so-called conservative measures. *(b)* Abscission of the prolapse, freeing of the wound from adherent and incarcerated iris, paring the wound edges and uniting them with a suture; or, if no suture is used, allowing the wound to unite under a compression bandage. Personally, I am governed by the following considerations in the management of this class of cases: If there are no threatening symptoms and no increase in the size of the prolapse, I leave it alone; if, however, there arise irritation from bandaging, ciliary congestion, and increase in the protrusion in spite of pressure, I abscise it, and, in recent years, close the wound with a suture.

In a number of cases treated by abscission of the prolapse and suture of the wound, I have never seen anything but good results, except in one instance, which represented an unusual, but not impossible complication (blood-staining of the cornea). There is little doubt that the hemorrhage following the abscission of the iris was responsible for the blood-staining of the cornea. Whether the condition would have healed promptly and favorably without operative interference is a matter of pure speculation.

II. *Cases of Prolapse of the Iris Through a Wound Extending Nearly or Entirely Across the Breadth of the Cornea, either Vertically or Horizontally.* These cases, it seems to me, present an entirely different problem from prolapse of the iris at the corneo-scleral junction; first, because the prolapse usually is more extensive; second, the underlying structures are more apt to be wounded; and third, the position of the prolapse is frequently such that a mydriatic is able to exert its most favorable influence.

If seen early—that is, before there is a marked adhesion between the prolapsed iris and the edges of the wound—it may be possible to replace the iris in whole or in part and keep it in position by pressure, atropin, and dorsal decubitus. If it is not possible to replace it through the entire length of the wound, the central portions of it may be freed with the spatula, while the prolapse at the peripheral end of the wound—that is, the one approaching the corneo-scleral junction—may be abscised and treated in the same manner as is a prolapse entirely located in this region. These cases must be exceptional, but I have one in mind with good result.

If seen later—that is, when the iris has already become firmly adherent to the edges of the wound, and the wound is at all extensive in length—I am inclined to agree with the advice recently recorded by Dr. Knapp, namely, to "treat the case expectantly as long as no threatening symptoms appear." This treatment, I believe, should be the one already detailed, atropin, or other reliable mydriatic, rest in bed, and compressing bandage. The chief reason for it, in my judgment, depends upon the fact that, in addition to the value of pressure, the favorable physiologic action of atropin, or other mydriatics, upon the iris is secured in a way not obtained when the prolapse is at or close to the corneo-scleral junction. The mydriatic rolls the iris back and tends to draw the prolapsed portion from the wound. This is proved by the fact that, in many of these cases, the iris is drawn out of the incision toward the central portion of the wound, while it remains clamped in the periphery, where the drag upon it is less effective.

To be sure, even when the prolapse is solely located in the periphery, there is also some influence exerted by the mydriatic to withdraw the attached iris from its position, an effect, however, which is partly, if not entirely, counteracted by the equal effect of rolling back another portion of the iris toward the prolapse. For this reason, in the peripheral cases, it has been the habit of surgeons to employ eserin, with the hope that under the influence of the contraction of the pupil the iris will be drawn from its attached position in the corneal poriphery. My experience, however, is that eserin is very apt to increase ciliary irritation and is not an acceptable drug in traumatic prolapse of the iris. I make exception of a few cases of prolapse after cataract extraction, in which I have seen it act very favorably. Moreover. abscission of an extensive prolapse across the corneal breadth results not in a small, smooth coloboma, but in a more or less unshapely loss of iris tissue.

Bacteriologic examination is an important factor in deciding whether or not there should be surgical interference in cases of prolapse of the iris seen late—that is, after closure of the wound by adhesive inflammation. As has been pointed out by Knapp, the surrounding cornea is infiltrated with micro-organisms, although the iritic tissue itself may be free from them." The writer relates the case of a boy of ten years, seen ten days after injury, who presented an extensive. ragged wound, extending across the cornea. Although the child was brought with the expectation of operative interference, advice against re-opening the wound and abscissing the prolapsed iris was given. The situation of the prolapse was such that the favorable action of atropin could be obtained; there were no marked signs of bandage irritation or ciliary congestion; the opening of the wound would, it seems to me, only have liberated. as it were, staphylococci, and presented to them paths for entrance into the deeper occular structures. Hence, the advice of expectant treatment, with the suggestion that probably later the case would have to be dealt with on the principles which govern the management of traumatic cataract.

III. *Cases of Prolapse of the Iris Through a Corneal or Corneo-scleral Wound, Associated with Lesion of the Underlying Structures, Generally the Crystalline Lens.* Certainly no hard and fast rule can be given to cover all cases, which, however, divide themselves into two chief classes:

1. Those cases in which the lesion is so extensive that

conservation of the eye is problematical. With these instances we are not specially concerned this evening.

2. Those cases associated with injury of the lens and followed by opacification and swelling of its tissue. The urgency of the symptoms and the age of the injury must decide action. Some of these cases must be relegated to the class already referred to and illustrated by an example to which expectant and primarily non-operative treatment is suited. In others both lesions may be dealt with at one sitting. Such a procedure, if possible, seems to me more desirable than a primarily non-operative course, for, at all events, operation later on is sure to be needed.

IV. *Cases of Prolapse of the Iris Through a Corneal Wound, with Prolapse of the Ciliary Body, or Process Through Its Scleral Extension.* Under these circumstances my experience coincides with that recently recorded by Dr. Knapp. The iris portion of the hernia may become quiet, or even withdrawn into the anterior chamber, while the ciliary end of the lesion forms a cyst-like protuberance. Therefore, if I see a case of this character, and it is a proper one for this manipulation, I clear the wound of all protruding ciliary tissue, if I may so express myself, and close it with sutures. These sutures are passed, however, through the conjunctiva overlying the wound, and not through the sclera; at least I am disinclined to pass them through the sclera, unless absolutely sure that this can be done without inclusion of any uveal tissue in the stitch.

If the case is seen late, *i. e.*, after the cyst has formed, the latter is excised, and the eye treated exactly as after abscission of pouch-like hernias of the iris, already described. While it is true, as pointed out by Knapp, that prolapses of the ciliary tissues "are apt to produce cyst-like ectasis, which, for their cure, require thorough excision," this rule also meets with exception.

V. *Management of the Adherent, Non-bulging Cicatrix After Healing of an Iris Prolapse.* As may have been gathered from what has been previously said, one of the chief advantages of operative interference in traumatic prolapse of the iris, under those circumstances in which I believe it to be not only justifiable, but the best procedure, is the securing of a non-adherent cicatrix. Now, although eyes which have healed without infective inflammation and without surgical interference are usually quiet, non-irritable organs in a certain number of cases, the slight drag on the attached iris during the movements of the pupil is the cause of pain and discomfort. Therefore, I would like to add one word in regard to what I may call the treatment of the sequel of prolapse of the iris, that is, of the adherent cicatrix. Take, for example, the case of the girl detailed, in which the iris prolapsed through a curvilinear wound, extending halfway across the breadth of the cornea, and was withdrawn into the anterior chamber at all points, except one near the center of the scar. At this point the iris was attached and lifted up in a minute tent-like extension, the pupil below it being somewhat ovoid in shape. In cases of this character I am accustomed to free the attached iris from the scar by the ordinary operation of division of anterior synechia. The method I prefer is the one specially advocated by Mr. Lang of Moorfield Hospital, in which an instrument not unlike the Knapp knife-needle is introduced into the anterior chamber and the synechia divided by a slight lever-like movement. The iris drops back into place, a drop of atropin solution rolls it out of danger of prolapse, and a circular pupil is secured. It is less easy to accomplish this manoeuvre when the iris is prolapsed in the periphery or angle of the anterior chamber, although it can also be done there with the same result. I have never seen harm follow this slight operation, and I have more than once seen an eye thus relieved, which had previously been persistently painful, grow comfortable and quiet.

The question of prolapse of the iris, as the result of perforating ulcers of the cornea, is not part of the discussion this evening, but it perhaps is not entirely out of place to say that these cases seem to me to demand the same line of treatment as the traumatic ones, and the management of the case is governed by the same principles as those already enunciated. In a few instances, where the prolapse has been an extensive one and has protruded through a large, somewhat irregular opening, which could not be neatly coapted with stitches, I have very successfully planted a flap, after the manner of Gama Pinto. In one instance, associated with the last stage of a gonorrheal conjunctivitis, I took the graft from the opposite or sound eye.

With reference to *prolapse of the iris as a complication of the simple extraction of cataract*, my practice is the same, I believe, as that of many surgeons, chiefly Dr. Knapp, namely: If the prolapse is discovered within a few hours after its occurrence, it is cut off and the edges of the iris reduced axactly as after the operation of iridectomy. If the prolapse is not noted until later, for example, the third or fourth day, it is allowed to remain until the eye is quiet, when, if there is staphylomatous bulging, the protrusion is abscised, or, in other words, treated as is a staphyloma of the cornea. In a few instances I have inserted after this operation one or two delicate silk sutures, and have been pleased with the result. Once I have seen the prolapse entirely reduced by the use of eserin, the iris being withdrawn into the anterior chamber and the pupil becoming perfectly circular on the sixth day after the accident.

In the beginning of this paper I said: "Evidently no single rule of surgical conduct is applicable to each case of traumatic prolapse of the iris." But, if an attempt to formulate such a rule should be made, which, like all other rules, must meet with exceptions, it would read somewhat as follows: Whenever it is possible to secure clean removal of the protruding tissue, operative interference is indicated; when this is not possible, non-operative measures, as in the instances already described, are worthy of consideration and adoption."

Experiments With X-Rays Upon the Blind.

HILGARTNER, H. L., AND NORTHRUP, E. F., of Austin, Texas. (*Journal of Eye, Ear and Throat Diseases*, July, 1897.)

The writers give the results of experiments with X-rays upon eleven blind subjects; seven had no light perception, the blindness being due principally to affection of the optic nerve, and four had some light perception. Three of the four having light perception were blind from trouble with the cornea and lens, while the fourth had paralysis of the optic nerve. As a result of these experiments the authors were forced to conclude that the X-rays have no power whatever of exciting vision, or even light perception, in any kind of an eye, diseased or normal.

Two Cases of "Electric-Light Blindness."

HILL, ROEERT, M. R. C. S. E., L. R. C. P., Surgeon H. M. S. "Victoriy," (*The Lancet*, July 24, 1897.)

Surgeon Hill reports two instances of this affection. Both patients had been looking at an electric drill; subsequently everything appeared to them of a dark gold color:

several hours later there was intense pain, lacrymation, conjunctival congestion and dimness of vision. After the use of cold compresses and the instillation of cocain, the symptoms disappeared, some slight conjunctivitis persisting. There was no complication of the cornea.

"Ever since the electric light has been in use workers at this trade have been subject to attacks of blindness, and cases have been recorded in which erosion of the cornea has followed the inflammation induced. Dark glasses are now always used by men so employed. The electric drill acts by fusing a hole through the steel, and probably the intensity of the light is greatly increased by the rays of light thrown off by the molten metal. The fact that the work is carried on chiefly in the daylight hides to a casual passer-by the extreme brilliancy of the light, and it is not until the patient experiences abnormal color sensations that he is aware of anything extraordinary.

"The pathology of this condition has been stated to be similar to that of snow-blindness, or desert-blindness, and to depend on irritation of the branches of the ophthalmic division of the fifth nerve. In the cases recorded the irritation would appear to have gone on to absolute paralysis and the pain to have been due to the acute congestion attending the nerves in their action of regaining their normal function. A somewhat analogous train of circumstances is found in the paralysis of the sensory nerves of other parts of the body when exposed to extreme cold, such as the ether spray or frost-bite, and the pain in these cases is often very great when the congestion attending the 'coming to' of the part takes place. The short period during which the severe pain lasted is also in favor of this analogy. The close sympathy that exists between the second nerve and the branches of the ophthalmic division of the fifth nerve is shown in many common and well-known reflexes, such as lacrymation and sneezing on sudden exposure of the eye to a bright light, or, conversely, the dread of light that is caused by any injury to the cornea. In the cases described we have a marked instance of the first class of reflex. A temporary paralysis of some of the optic nerve terminals is induced by the exposure to the intense light and heat of the electric drill, as shown by the subjective color sensations experienced. The corneal terminals reflexly share in the paralysis; lacrymation and photophobia are absent because the nerve terminals are paralyzed, and not merely irritated, at the time. After the lapse of a few hours a reaction, with temporary congestion. is set up, as manifested by the acute pain and lacrymation, and probably some mistiness of vision. The longer the exposure to the bright light the profounder the paralysis and the more intense and lasting the reactionary symptoms. The cases are, in fact, analogous to snow-blindness, and, as in them, the pernicious effects of the electric light are probably due to the ultra violet rays of the spectrum."

Congenital Nystagmus.

COLBURN, JOSEPH ELLIOTT, M, D., Chicago. (*Amer. Jour. Oph.*, August, 1897.)

In a lengthy paper based upon observations in seventeen cases, the writer discusses the causes, peculiarities and treatment of congenital nystagmus. He says: "Persons afflicted with congenital nystagmus occurring in conjunction with vision which is normally fair. but for the spasm of the recti muscles, or which can by the aid of proper correcting lenses be raised to fair vision, may be greatly improved in personal appearance, and the nystagmus movements lessened or totally suspended by relieving the abnormal relation existing between the motor muscles of the eyes themselves, or between them and the soft bony structures in which they are suspended. In a limited number of cases the correction of the errors of refraction, which have usually been high, have been sufficient to do away with the tremulous or oscillating movement." His conclusions are:

1. Congenital nystagmus may be due to amblyopia from any cause, or from ametropia.

2. Congenital nystagmus may occur in atypic development of the eye and its appendages, and be due wholly or in part to the exhaustion or irritation of the motor oculi muscles or their nervous centers in their attempt to co-ordinate with the other acts of vision.

3. In treating cases due to amblyopia from errors of refraction, the corrrction of the errors may lessen or completely cure the spasm.

4. Those cases which are due to amblyopia from other causes than errors of refraction may be relieved directly as the cause of the amblyopia can be removed.

5, The cases which are due to atypic development of the eyes or their appendages may be relieved so far as we are able to properly establish them in normal relation to each other and their surroundings.

The remedies of science in my hands have been, first, carefully correcting errors of refraction and the placing of correcting glasses in the best position to secure the best vision; second, training the eyes to perform their ranges of rotation with the head fixed; third, operations upon the recti muscles to secure full abduction, adduction and central fixation with eyes at point of greatest rest.

The Effect of Kindergarten Work on the Eyesight of the Children.

Wood, Casey A., M. D., Chicago, Ill. (*N. Y. Med. Jour.*, July 17, 1897.)

The writer gives the results of several years of investigation of the methods employed by kindergärtners in their relation to the eyesight of children. His observations led him to make the following *suggestions:*

1. "Every kindergarten and every school should be provided with certain well-known and simple test of vision, and no child of any age should receive any instruction who has not good eyesight.

2. "It should be a part of the teacher's duty — in the public schools and in some private institutions the teacher is the only guardian (in any sense) that the child possesses—to note any defects of vision, and have them corrected if possible.

3. "No child with uncorrected or incorrigible defects should be allowed to use his eyes for any kind of close work before he is 8 or 9 years of age, lest worse things befall.

4. "In the kindergarten the children should be taught only those things that demand the minimum employment of the accommodation for near work. Froebel's 'gifts' are sufficiently numerous and varied to enable both teacher and children to pass happy and profitable hours without damaging the precious inheritance of vision, and without inflicting defective eyes upon generations yet unborn.

5. "Some kinds of instruction are, in their nature, unsuited for infants eyes. I admire the work and teachings of such well-known authorities as Kate Douglas Wiggin and Nora Archibald Smith. and agree with them in many of their contentions. For example, I feel, with them, that it is questionable whether 'children naturally incline to large movements in drawing,' and that 'they itstinctively

make pretty figures.' I would certainly not allow them to engage in any kind of drawing, because the tendency always is, as with the grown-up folk, to indulge more and more in elaborate designs.

6. "If one turns to the plates in the back of Josephine Jarvis's translation of Frederick Froebel's *Spiel und die Spielgegenstande der Kinder*, or to the elaborate designs affixed to many similar text books on kindergarten study (Mrs. Rowland Hill's *Brush Work for the Kindergarten*, for example), it will not be difficult to eliminate those occupations and studies that are palpably inimical to the eyesight of the child.

7. "Speaking broadly, Froebel's first four 'gifts,' and the uses to which they are ordinarily put in the kindergarten, and the occupations to which they may give rise, are mostly devoid of harm, as far as the eyes are concerned. They also suggest many *Mutter* and *Koselieder*, the use of which leaves so little to be criticised that I sometimes ask myself whether the balls and blocks and the accompaniment of song and play kindergarten children might not be made to undergo a healthier development than that which the more complex and elaborate occupations subserve.

8. "Above all do I depreciate certain occupations commonly recommended by and pictured in most of the latest kindergarten text books. These are perforating cards, embossing, fine sewing, drawing in all forms and phases, most kinds of paper interlacing, intricate paper cutting and folding, peas work, clay modeling, chain making (except when the links are very large), bead stringing, etc. These practices, however little indulged in, are almost certain to damage the eyesight of kindergarten children.

9. "Among the less hurtful occupations—some of them harmless—are games not involving near work to any extent, slat interlacing (the wide slat of well-contrasted colors), sand work (especially if indulged in as German children use it—out of doors), gardening, that Froebel loved so well, building with large blocks, and the occasional use of simple apparatus, like Pitman's 'busy work tiles.'"

My plea, therefore, is for work that one connects with a real garden—a genuine child's garden. This would be particularly appropriate in the case of American children, who, living in our stimulating climate and in our stirring times, need to have their physical well-being above all considered. Plenty of air and sunshine, a minimum of instruction, a maximum of natural enjoyment—these I would have in every kindergarten. The lessons that children love to learn from real plants and some animals and many products from the animal, vegetable and mineral world—all these I would teach from samples kept in stock. But the use of the eyes upon fine work of any kind, as well as their employment for more than a few minutes duration upon any sort of near occupation, I would absolutely forbid. These sanitary precautions may not mirror the letter of Froebel's teachings, but in my opinion they reflect the spirit of the master."

Scopolamin Hydrobromate as a Cycloplegic.

MURRELL, T. E., M. D., Denver, Col. (*Archiv. of Oph.*, July. 1897.)

The writer's report is based upon observations in two hundred cases in which the refraction was determined under scopolamin. He mentions certain objections to the use of atropin and homatropin, which he says scopolamin is free from. He believes solutions of this drug to be germicidal or fungicidal, since no evidences of deterioration were found in solutions which had been kept for more than a year. He concludes with the following *summary:*

1. Scopolamin hydrobromate is the most positive and prompt cycloplegic we have. 2. It should not be used in a stronger solution than one-tenth of 1 per cent. 3. Two instillations at most are all-sufficient for the most thorough suspension of the accommodation. 4. It is free, in this strength, from the danger of increased tension. and causes no redness of the conjunctiva nor engorgement of the choroid, and no unpleasant symptoms other than those due to its physiological action. 5. It is convenient to use, reliable in its results, safe, keeps well, and possesses fewer objections than any other known cycloplegic. After twenty years experience in the use of agents to control the accommodation for determining errors of refraction, two years' use of scopolamine hydrobromate in some two hundred cases has satisfied me, personally, that it is the best agent for this purpose that has thus far been given us by materica medica.

On Romoval of the Eye and Mules' Operation.

CARTER, R. BRUDENELL, F. R. C. S. E,, London, Eng. (*The Lancet.* July 31, 1897.)

In a paper which opens with a sharp criticism of the

Ophthalmological Society of the United Kingdom, Mr. Carter gives his results with this operation during a period of twelve years, in which he resorted to this surgical procedure in nearly every case in which previously he would have removed the eye; the exceptional cases were (1) intra-ocular growths of suspected malignancy, (2) cases in which sympathetic ophthalmitis had commenced, and (3) a few instances of blind and painful eyes in aged people, for whom it was desired to avoid the healing stage of a Mules' operation and with whom appearance was a secondary consideration. He lays stress upon the necessity for careful removal of the ciliary body and choroid, leaving a clean, white sclera. Considerable space is devoted to exact definitions of "sympathetic ophthalmitis" and "sympathetic irritation," meaning the states first described by Donders in 1865. After quoting from various authors, he accepts, for the purpose of this communication, Swanzy's definition of sympathetic ophthalmitis, and, at least provisionally, regards "the cases in which disease other than irido-cyclitis or irido-choroiditis has appeared in a sound eye at an uncertain time after disease or injury of its fellow as being open to the possibility of some different explanation.

The writer enters a protest against the use of "the far-fetched and nasty metaphors, 'eviscerate' and 'exenterate' by which the operation of removing the contents of the eyeball has been described. * * * We 'empty' the several cavities of their contents, and we do the same with the sclera."

Having cleared the ground, he continues: "I may say that I have performed Mules' operation in about 150 cases. In consequence of the accidental loss of some notes I am unable to state the precise number; but this total is not far from the truth. The patients have been of both sexes, and of ages ranging from 9 months to 70 years. Speaking generally, I have been more than satisfied with the results. one loses sight, of course, of the majority of hospital patients; but many of my private patients, after several years, are still wearing artificial eyes with perfect comfort and with natural appearance. There is no irksome pressure from the edges of the artificial eye, no hollow between the upper lid and the margin of the orbit, and no cavity in which secretion accummulates. There is free mobility of the artificial eye in all directions—somewhat less of course, than that of the natural eye, but sufficient to preserve the correct relative position in ordinary use. I have lately seen three patients who were respectively operated upon in the years 1886, 1887 and 1888; and to all of them, as well as to more recent cases, the foregoing description will apply. In my early operations, for want of experience with regard to certain details, such as the best size of ball, or the best material for sutures and the best way of inserting them, I frequently failed to obtain complete union; and, with an exception to be presently mentioned, incomplete union always involved the ultimate escape of the ball. Even if the original opening were a mere pinhole it underwent dilatation, as the ball was pressed against it from within by the external ocular muscles, the effect sometimes reminding me of the dilatation of the os uteri by the fetal membranes. The consequent enlargement of the opening was often very slow, and was always painless until the diameter was nearly equal to that of the ball. It then became painful by reason of the greater force which the muscles were able to exert; and it has been my practice in such cases slightly to incise the margins of the opening and to let the ball come out. * * * * Even if the ball escapes, whether immediately or after a time, the condition of the patient is infinitely better and more comfortable than after removal of the eye. The stump formed by the collapsed sclera is not so good as that formed by the sclera with a contained ball, but it is in every respect far better than that formed merely by the collapsed muscles. The next best thing to the ball staying in, is its coming out, and, except in one case, I have never seen any collection of fluid in the scleral cavity, either when the ball was exposed or after it had escaped. I have never seen a single instance of "sympathetic irritation" subsequent to the operation, nor a single instance of "sympathetic ophthalmitis" in the sense of the definition above laid down; but I have seen four cases in which the previously sound eye has subsequently suffered from serious disease." After describing these four cases with some minuteness, Mr. Carter concludes his paper as follows:

"It will be seen from the foregoing narrative that I have met four cases in which, after the performance of Mules' operation, the remaining eye has been attacked by serious disease. It is remarkble that the four cases were totally unlike in there origin and nature, and that the diseases attacking the second eye were also totally unlike, It is remarkable that neither the ordinary phenomena of sympathetic irritation nor the ordinary phenomena of sympathetic ophthalmitis were exhibited in any one of them, and that in none of them was there any tenderness of the Mules stump. In most cases of supposed sympathy occurring after the lapse of years it has been recorded that the eye by which the sympathy was excited had become tender or painful shortly before the sympathetic outbreak. I am strongly of the opinion that if in my cases the eyes on which Mules' operations were performed had been removed instead, the subsequent occurrences would have been precisely the same, except that no idea of sympathy would have been suggested. Moreover, it must be remembered that sympathetic ophthalmitis of the ordinary type is by no means unknown after removal of the eye. Many cases of the kind have been recorded, and one of the most recent of them may be found in the *Annales d'Oculistique* for the present year. The question raised by Mr. Cross is one which deserves all the observation and all the acumen which can be brought to bear upon it. On one hand, the superiority of excision of a joint over the amputation of a limb, and, on the other hand, even this enormous advantage must not be conceded to patients if it be attended by any measurable risk of destructive changes in the eye which remains sound. My personal experience induces me to believe, with some confidence, that the risk is purely imaginary, or, at least, that it has no better foundation than the occurrence of a certain number of coincidences."

A Method of Obviating Recurrence After the Operation for Symblepharon.

SCOTT, KENNETH, F. R. C. S., Edin., Cairo, Egypt. (*The Lancet*, July 31, 1897.)

The case described was one in which the upper eyelid and the cornea had become firmly adherent. After a dissection sufficient to separate these parts, the upper eyelid was everted and its ciliary margin fastened to the eyebrow by fine silver wire sutures. The eye was then treated as a case of extensive corneal adhesion by atropin and dressing of vaselin with sprinkling of dermatol. By means of the use of fluorescin the healing of the denuded cornea was carefully guaged and when the process was complete after the lapse of four days, the retaining sutures were removed and the eyelid allowed to resume its normal position. The result was satisfactory.

An Operation for Trichiasis Due to Cicatricial Entropion.

MAHER, W. ODILLO, M. D., Sidney, N. S. W. (*Archiv. of Oph.*, July, 1897.)

The writer describes an operation which he has found most satisfactory in cases of trichiasis and districhiasis due to cicatricial entropion, as follows:

" Standing behind the patient, who is anesthetized, I evert the lid, and make a puncture with a Beers knife through the tarsal cartilage, at the outer canthus if operating on the right lid, and at the inner canthus if operating on the left. and divide the cartilage and all structures of the lid to the skin from end to end. parallel with and about two and one-half millimeters from its free edge, with a straight, blunt-pointed scissors, by passing one blade through the puncture, and subcutaneously along the length of the cartilage. The lower lip is now clamped with a Snellen entropion clamp to prevent hemorrhage, and a flap of mucous membrane the length of the incision in the cartilage, and from two or three millimeters broad, is marked out by two or three parallel cuts with a Beers knife, and removed by a few snips of the scissors. The mucous membrane flap is then laid on the tip of the forefinger of the left hand, and any sub-mucous tissue snipped off with scissors. Three silk sutures, two single and one double, with knots about two centimeters from the ends, are used. The single sutures are passed through the ends of the flap from its mucous surface, and then through the ends of the cut in the cartilage, coming out on the cutaneous surface of the lid near the canthi and a few millimemeters from its free edge. The double suture is now passed through the middle of the flap from its mucous surface and through the middle of the cut in the cartilage, coming out on the cutaneous surface of the lid midway between the canthi and a few millimeters from its free edge. By drawing on these sutures, the knots pull the flap of mucous membrane well in between the cut edges of the cartilage. An assistant now applies with his finger a little traction on the skin of the lid, so as to cause the edge of the lid to evert and the wound in the cartilage to gape. The sutures are then tied. Either the two single or end sutures are tied together across the lid parallel with its free edge, and between the two threads of the double suture, which are tied over them, or the single end sutures may each be tied to a thread of the double central suture. I consider the latter the better way of tying the sutures, as the former sometimes causes the middle edge of the lid to evert a little too much. The edges of the wound in the lip, which causes very little inconvenience, are brought together with sutures, and it heals by first intention. The eyelids are dressed with an antiseptic dressing smeared with iodoform ointment, and left undisturbed for thirty-six hours, when the sutures are removed. The object of having the knots a couple of centimeters from the ends of the sutures is to facilitate their removal. The eyes are kept bandaged for a few days, so as to prevent any disturbance of the flap, *which takes readily*.

"This operation was first performed by me in April, 1896, and during the following twelve months I operated upon sixty-one cases. In two cases only, the operation was a partial failure, as a few hairs on the outer canthi were touching the globe some weeks after the operation. The cause of the these two partial failures was that the cartilage had not been divided up to the outer canthi. All the others were highly satisfactory, and some I have seen nine months after the operation. A special feature about this operation is that no tissue is removed from the lid, but tissue added to replace cartilaginous tissue at that part where it has undergone absorption. It produces no disfigurement, and the results are most satisfactory. The effect of the operation can be enhanced by a subcutaneous division of the outer canthus."

ABSTRACTS FROM CURRENT NEURO-OPHTHALMIC LITERATURE,

By Wendell Reber, M.D.

PHILADELPHIA, PA.

More About Exophthalmic Goitre.

Eulenberg. in the section on Neurology of the 15th Medical Congress at Berlin, June 9-12, 1897, (*Monatschrift f. Psychiatrie und Neurologie*, August, 1897), in speaking of the etiology of exophthalmic goitre. remarked that there are now three theories as to its origin, the hematogenous, neurogenous, and thyreogenous; that although goitre, exophthalmus, and rapid heart are put down as the cardinal symptoms, there are others, such as Graefe's, Stelwag's, and Moebius' signs, nystagmus, and absence of electrical reaction that must be reckoned with. Unfortunately there is no sign or symptom pathognomonic of this disorder.

It was Basedow who first referred this symptom complex to alterations in the composition of the blood, a theory that for many years held full sway. The neurogenous theory seeks origin for this disorder in derangements of of the sympathetic nerve, the vagus, or other portions of the central nervous system. The thyreogenous theory is of recent birth, traceable perhaps to Gauthier, who drew attention to the disturbance in the chemistry of the thyroid gland. Moebius pronounces it an intoxicaton and pictures the contrast between exophthalmic goitre and myxedema, observing, at the same time, that this contrast does not always obtain. All things considered, one is justified in assuming both qualitative and quantative alterations in glandular activity, in which perhaps the blood elements participate.

All these theories have influenced treatment more or less. Antianemics and reconstructives are indicated by the hemategenous theory. Electrotherapy and psychotherapy are indulged in by the advocates of the neurogenous theory. while organotherapy is the hope of the third school. This latter method is lightly valued by Eulenberg. Surgeons extol thyroidectomy, a measure which E. thinks ought to be reserved for desperate cases, which assertion he emphasizes by adducing the history of a 17-

year-old girl who died three days after extirpation of the gland.

In the discussion which followed Eulenberg's paper, Matthes, of Jena, stated that he had noted arrest of the hyperactivity in tissue change after operation on the thyroid; also that, in occasional cases, the body weight increased, although he was not sure that there was not slight increase of body weight after nearly every thyroidectomy. In one case under his observation, complete arrest of the excretion of albumin followed feeding of the patient with her own thyroid which had been removed the day before. Magnus-Levy agreed in the main with Matthes. Fr. Mueller directed attention to the fact that enlargement of the cervical glands occurred in 75 per cent. of all cases. As to metabolism, hyperactivity of the oxidation processes was the primary, and change in the albumins the secondary result.

Cortical or Soul Blindness.

LUNZ, M. D. (*Neurologisches Centralblatt*, August 15, 1897), presented two instances of this disorder at the March meeting of the Moscow Neuro-pathologic Society.

The first case occurred in a 55-year-old man, who, after two apoplectic strokes, developed slight paresis of the left extremities and total blindness, notwithstanding which the pupillary reactions, eye grounds and eye movements were all normal. Mentality was poor. Articles were recognized only by their taste, while the hearing and touch sense conveyed indefinite impressions, *e. g.*, the patient called a watch-chain a watch, and all he could say about a steel pen was that "it stuck." Terminal dementia characterized the closing phases of the disease. The necropsy showed marked arterio-sclerosis at the basis cranii, especially the posterior cerebral artery. Yellow softening of the inner two-thirds of the occipital lobes was found, as also small spots of yellow degeneration at the point of the left occipital lobe.

In the second case, a 36-year-old man, syphilis had been contracted twenty years before, although there had been no particular subsequent trouble. After a headache of several days duration, there ensued vertiginous attacks, with slight paresis of the right extremities. Then followed partial, and later complete blindess, although no abnormality in the pupillary conditions, the eye ground, or the ocular muscles could be shown. Mentality was good.

Some improvement in vision was secured by vigorous antisypilitic treatment, following which left hemianopsia and contracted field on the right were found. The vision equalled 3 10, and reading and writing became possible. Although colors could be differentiated by matching, they could not be named. Small articles were properly named, but, strangely enough, his best acquaintances were not recognized by photograph, while their voices immediately called forth recognition. The optical memories of the streets, places, and buildings of Moscow (his native city), were completely obliterated. The memory pictures of the other special organs were intact, and his powers of mental calculation were astonishing.

The two cases are strikingly similar in their apoplectic origin and in the consequent total cortical blindness, the typical features of which were obscured in the first case by the dementia.

On the Diagnosis of Paralysis of the Cervical Sympathetic.

PICK AND FRIEDEL (*Centralblatt fur Nervenheilkunde und Psychiatrie*, April 20, 1897), studied this phenomenon in a 31-year-old woman, who presented the symptoms of probable mediastinal tumor, to-wit: Thoracic pains, dyspnea, moist skin over the right thorax, and a rough, hard prominence the size of a walnut near the insertion of the fifth and sixth ribs, all of which signs were associated with a cyanotic condition of the face and tremendous dilatation of the superficial veins of the whole anterior aspect of the trunk. The eye symptoms were as follows: Left pupil 8 mm. in diameter, right pupil 5 to 6 mm. Left palpebral fissure wider than the right, and left globe much more prominent. The left seemed to be the pathologic side, and as there was present an enlarged cervical gland in the left supra-clavicular fossa, the diagnosis of irritation of the left sympathic was made tentatively. In time the clinical picture became even clearer apparently, and yet it was found later on that both pupils responded promptly to light, a fact difficult to reconcile with the diagnosis of an irritative lesion. After much further study of the case, the authors concluded that they had to do with a right cervical sympathetic paralysis, secondary to an intrathoracic neoplasm, which diagnosis was confirmed at the autopsy when the left sympathetic nerve was found intact, while at the site of the right inferior cervical ganglion was situated a neoplasm extending from the upper border of the root of the seventh cervical to the root of the fourth dorsal nerve, that had destroyed the sympathetic nerve throughout this distance. The case illustrates the difficulty in deciding between sympathetic paralysis and irritation of the sympathetic nerve. The passive congestion induced by pressure on the vena cava gave rise to considerable exophthalmus, especially on the left side.

On Asthenic Ophthalmoplegia.

KARPLUS, J. P., M. D., (*Neurologishces Centralblatt*, June 15, 1897), conducted in Kraft-Ebings clinic, a study of a rather unusual disorder.

The case history is as follows: A young woman, aged 24, developed in her fifth year slight right ptosis, followed soon after by a similar more marked condition of the left upper eyelid. After a year's duration, the palsy disappeared on both sides, from which time on there were occasional relapses of the trouble, accompanied sometimes with double vision. In September, 1894, however, ptosis reappeared and endured for a month, when there was added to it paresthesia, functional weakness of the extremities, external ophthalmoplegia, and partial arrest of function of the frontal and oculo-facial nerves. The endocular muscles and the lower facial muscles were not involved, while the muscle of mastication showed slight weakening. Two months later the extremities had regained their power, and by April, 1895, the ptosis had vanished and the ocular palsies were much better, although the muscles were easily exhausted. By June, 1896, the palsies, now almost completely gone, would reappear whenever the patient was physically fatigued, and she was much more conscious of them evenings than mornings. In the fall of 1896 ptosis could no longer be shown. There still persisted a paresis of the abductors and elevators.

The condition described is not to be confounded with the hitherto well-known ocular palsies,but falls naturally into that group of cases first described by Erb, and later by Struempel, who called it asthenic bulbar paralysis. As parallel symptoms between the affection just mentioned and his own case, Karplus notes the sudden exhaustion, the evening increase of the symptoms, the long drawn out nature of the affection, the subsequent recovery, the absence of whatsoever sensory disturbances, and the participation of the extremities in the symptom picture. The author refers to a series of cases in the literature that present symptoms of both asthenic bulbar paralysis and ordinary ophthalmoplegia, such as those described by Erb, Eisenlohr, and Goldflam. Camuset, also, referred in 1876 to a symptom complex that approaches closely to the above, and some cases detailed by Mauthner and von Kunn probably belong in this category. Karplus further believes that certain symptoms of asthenic bulbar paralysis (especially the exhaustion), may complicate the other forms of ophthalmoplegia. as, for instance, in Kalischer's case. However, notwithstanding all the likenesses that have been noted, Karplus feels that there is a distinct individuality about the malady he describes.

NOTES AND ANNOUNCEMENTS.

The Ophthalmological Congress met in Heidelberg this year on the 5-7 of August.

An epidemic of granular ophthalmia is reported among the school children of Hamburg.

Dr. Hugo Wintersteiner has been accepted at the University of Vienna as Docent in Ophthalmology.

The Prince of Wales has been elected an Honorary Fellow of the Royal College of Physicians (England).

Japan proposes to equip two vessels of about 2,000 tons each, to be used at sea as marine hospitals for injured and sick sailors.

By the will of Mrs. Nathaniel Thayer, of Worcester, Mass., the Eye and Ear Infirmary of Boston receives a bequest of $10,000.

Dr. M. Gibson Porter, a graduate of the University of Maryland, has been elected for the second time mayor of Lonaconing, Maryland.

Dr. Silex, first assistant and privat-docent in Schweigger's Clinic at Berlin, has been appointed extraordinary professor at the same place.

Gustav Braun, professor of ophthalmology at Moskow, died April 17, 1897, after thirty-three years active service in the University Eye Hospital.

Prof. Th. Englemann, of Utrecht, has been called to, and accepted the Professorship of Physiology at Berlin, made vacant by the death of du Bois-Raymond.

Mondheuk, the sculptor, has just received an order for the bust of the late Dr. E. Williams, who was the founder of the Ophthalmic Institute of Cincinnati.

Holmgren, Professor of Physiology at the University of Upsala, (Sweden,) who did so much for ophthalmology in his studies of color vision and retinal sensation, has recently died at the age of 66.

The memory of Henry Willard Williams, of Boston, who died rececently, has been honored by a worthy obituary notice just published in Zehender's Monatsblätter für Augenheilkunde, June, 1897.

Dr. T. B. Schneideman has been elected Professor of Diseases of the Eye in the Philadelphia Polyclinic and School for post-graduates in medicine. This is a recognition as fitly bestowed as it is well deserved.

Among the Philadelphia ophthalmologists who visited Europe this summer on pleasure or knowledge bent, we note Dr. S. D. Risley, Dr. George de Schweinitz, Dr. M. W. Zimmerman and Dr. William F. Sweet.

◆

The New York City Board of Education are to determine what color is best for school room walls. A commission of ophthalmologists is to be selected to decide on the matter. The idea originated in France.

◆

A New Jersey doctor—and he ought to know—claims that the mosquito will avoid anyone who annoints himself thoroughly with a lotion of one part of oil of sassafras to five of alcohol. But the bath must be taken frequently.

◆

Trachoma has become of such frequency in West Prussia that it has been decided to establish a policlinic in Danzig for its study and treatment. Prof. Greef, of Berlin, is to be placed in charge, and will give courses on trachoma to all physicians in the neighborhood.

◆

St. Marks' Ophthalmic Hospital and the National Eye and Ear Infirmary, in Dublin, have been recently amalgamated by act of parliament, and called the Royal Dublin Eye and Ear Hospital, Dublin. A new building, modern in every requirement, with 120 beds will be erected.

◆

A. Wassermann, in *Berliner Klinische Wochenschrift*, Aug. 9, '97, describes a new culture medium for the gonococcus, using a mixture of pig's serum, casein, soda phosphate and nutrose, which can be prepared and used by ordinary means, much to the advantage of the general practitioner.

◆

Pukalof (*Vratch*, No. 27, 1897,) treats gonorrheal conjunctivitis by powdered calomel, first cleansing the lids as well as possible by a boric acid (2 per cent. solution) and subsequent drying by cotton or gauze. He sometimes stops the disease by one application, and seldom does it pass beyond a week's treatment.

◆

China is the home of myopia. The peculiar character of type used and the traditional method of study adopted by old and young since the time of Confucius, have combined to require a close scrutiny of the printed (written) page, and to encourage the constant and exaggerated use of accommodation at the near point through generations.

◆

An interesting discussion of educators was recently reported in the *Berliner Klinische Wochenschrift*, in which both laymen and physicians took part. It was resolved that every school committee should have as a member at least one medical man and that all questions of school hygiene, such as size of room, amount of space and light, number of working hours, as well as the character of the work itself (presumably to its relation to the eye) should be submitted to his judgment as a scientific problem before a final decision could be reached.

◆

At the April 29th, '97 meeting of the Medical and Chirurgical Society of the state of Maryland, Dr. Harry Friedenwald read an interesting historical sketch of ophthalmology and otology in Maryland. He said that as early as 1805 licenses for oculists were issued in Baltimore. The earliest oculist was Dr. Pierce Chatard, from France, who was a prolific writer on the eye. Others were Drs. Wm. Gibson, George Frick, D. Cahen, Jameson and Harper. Dr. Frick's book was the first to appear in English in Baltimore and the third in the English language.

◆

After a two months absence from Philadelphia, Dr. George M. Gould returned to his work, fresh with the breezes of the Pacific. During his absence, the doctor spent four weeks at his summer home at Westfield, N. Y., leaving there the middle of August for the meeting of the Association for the Advancement of Science at Toronto, from which point he journeyed to the meeting of the British Medical Association at Montreal. After the Montreal meeting, in company with several of the visiting British delegates, he proceeded via the Canadian Pacific across the continent to Vancouver, returning to Philadelphia October 1.

◆

It has finally leaked out why her Gracious Majesty Queen Victoria was obliged to send across the channel for an eye doctor. The London consulting ophthalmologists are so busy that they are daily obliged to turn away patients of the highest social and financial status, and probably, therefore, the expense of time and money incurred by the trip to Windsor could not be made worth their while. This seems to contradict the expressions of alarm over the "dispensary abuse" so frequently found in the British medical press, but as a story grows by the telling of, I give this only for what it is worth, and refuse responsibility for its authority.

◆

The twenty-third annual meeting of the Mississippi Valley Medical Association was held in Louisville, Ky., on October 5, 6, 7 and 8, 1897. Among other papers, those of special interest to the ANNALS were:

S. C. Ayers, Cincinnati—Further Observations in the Use of Hydrogen Dioxide in the Treatment of Blepharitis Marginalis.

J. O. Stillson, Indianapolis—Retro-bulbar Optic Neuritis.

K. K. Wheelock, Fort Wayne—Plastic Operation for Repairing Inter-palpebral Space.

C. Barck, St. Louis—Avulsio Oculi with Presentation of Specimen.

Phillip Zenner, Cincinnati—Tobacco Neurosis.

James Moore Ball, St. Louis—Report of Some Cases of Ophthalmic Surgery.

W. H. Wilder, Chicago—The Causes and Treatment of Phlyctenular Keratitis.

J. Ellis Jennings, St. Louis—An Improved Skiascope to Facilitate the Shadow Test in Estimating the Errors of Refraction.

◆

Wochenschrift für Therapie und Hygiene des Auges (journal, weekly, for therapy and hygiene of the eye) is the name of a new publication begun October 1, 1897, under the editorship of Dr. Wolffberg, in Breslau. It promises to be of a substantially practical nature, and, as the editor says, its aim will be to fill the gap between the special publications dealing with theoretical problems, and the general medical literature, where so much of value escapes the specialist.

The subjects treated will be classified as follows:

(a) Epidemiology and Bacteriology—Trachoma, Ophthalmia neonatorum.
(b) School Hygiene.
(c) Occupation diseases and injuries.
(d) Heredity
(e) Blind Asylum Work.

Many other subjects will be regularly and exhaustively handled.

The subscription price is 1.50 M. quarterly. (The foreign price is not given). The publishers are Preuss and Jünger, Schmiedebrücke, No, 29a, Breslau.

BOOK NOTICES.

Atlas of Ophthalmoscopy.

HAAB, O., Zurich. (*Atlas und Grundriss der Ophthalmoscopie und Ophlhalmoscopischen Diagnostik.*) Lehmann's Medicin. Handatlanten, Band VII. J. F. Bergmann, München, 1897.

The second edition of Haab's Ophthalmoscopic Atlas has been enlarged by 15 pages of text and 15 more plates. The most noteworthy addition is anatomic plates by Schwerrer: a plate giving relative sizes of the pupil is also added. This octavo volume of 80 pages text and 80 plates is one of the best additions to ophthalmic text books that has come out within the decade. Its price is 10 marks ($2.50), which places it within the reach of students. The colored plates are artistically and technically excellent, and embrace the whole field nearly as well as the larger and more expensive works of Liebreich, Jaeger and Oeller. H. V. W.

The Structure and Ophthalmoscopic Appearances of the Choroid.

GREEFF, R. (*Der Bau und das ophthalmoscopische Aussehen der Choroidea.*) Augenaertzliche Unterrichts Tafeln, edited by Prof. H. Magnus. J. V. Kerns, Breslau, 1897.

These plates are especially valuable for teaching purposes. The text accompanying is of such a nature that lecturers may be afforded valuable facts which, if necessary, may be further added to. This monograph contains a large chart of a choroidal section diagramatized, and three typical forms of choroid, which he characterizes: 1. With great amount of pigment in the epithelium. 2. With but little. 3. With little or none; showing types from that of the negro to the albino. H. V. W.

Guide to Ophthalmology.

V. MICHEL, J., Würzburg. (*Klinische Leitfaden der Augenheilkunde.*) J. F. Bergmann, Wiesbaden, 1879.

This is the second edition of his previous compend of ophthalmology, increased by 34 pages and carefully revised. Although the book is designed to supplement clinical teaching, it would be better if the material therein given was not so greatly condensed and if illustrations had been more freely used. It contains, however, a thorough presentation of the present status of ophthalmic practice.

H. V. W.

Compend of Eye Diseases.

HERSING, F., Mülhausen. (*Compendium der Augenheilkunde*), 312 pp. Ferdinand Enke, Stuttgart, 1897.

The eighth edition of this work has been re-written and the outlines of ophthalmology are given in a more concise form than in the previous editions. The author hopes that it will become a *vade-mecum* with those students who wish quickly to make an acquaintance with the more common forms of eye diseases, and yet he has described the more severe forms and technical methods in a manner to be of use to specialists. The dioptrics of the eye are entered into and methods of refraction examination are gone into. Skiascopy, with the concave mirror, is poorly described in a manner that would lead me to infer that the author does not practice it. No allowance is made for the over-correction by this method for different distances of examination. The plane mirror is not described, the author simply stating that the appearances are reversed. In describing direct ophthalmoscopy in the detection of astigmatism, he states that the optic nerve may be oval and thus simulate astigma-

tism of high degree, but does not call attention to the fact that in high degrees of astigmatism there is blurring of the edges of the optic nerve simulating neuritis. His treatment and description of diseases is concise and exact. The description of muscular anomalies and their correction leaves much to be desired. Of particular worth is his chapter on injuries to the eye and the estimation of the business capacity of the individual in different degrees of blindness. A fairly complete index concludes the work.
H. V. W.

Color Blindness and Its Diagnosis.

OHLEMANN, Münden. (*Die Farben-Blindheit und ihre Diagnose*), 18 pp. J. H. Meyer, Braunschweig, 1897.

This essay is a practical presentation of the diagnosis and nature of color defects. Red and green blindness are shown to be the common defects, blue and yellow blindness occurring extremely seldom, and the results of these examinations are not uniform. It contains a well made clear plate of the appearance of the spectrum as perceived only by the normal eye, the so-called red blind, by the green blind, and by the totally color blind, showing the defects of the different forms of color blindness, as compared with the spectrum seen by the normal eye. The methods of examination are clearly and briefly described, the author claiming that Daaes' plates and Seebeck's tests with worsteds, or the modifications of Holmgren or Thomson, are sufficient in practice. H. V. W.

The Eye Diseases of the Early Periods of Syphilis.

WILBRAND, H. & STAELIN, A. (*Ueber die Augenerkrankungen in der Frühperiode der Syphilis*), with a colored plate and 8 illustrations in the text; 66 pp. Leopold Voss, Hamberg and Leipzig, 1897.

The authors have had the opportunity of systematically examining the eyes of 200 patients in the early stages of syphilis who were in the syphilitic department of the St. George general Hospital, in Hamburg, under the care of Dr. Engel Reimers. Of these 400 eyes 80 were found to be absolutely healthy, although six of these had diminished vision due to error of refraction or congenital amblyopia. In 320 eyes there was some pathologic change. The book is replete with statistical tables giving the relation of syphilitic eye diseases to other eye diseases and percentages of sypilitics affected with eye diseases as collected from the literature. In the 400 eyes examined by W. and S. 95 had disease or anomaly of the eyelids; 165 had conjunctival disease; the sclera was only affected in one case. The cornea was affected in six eyes, and there was parenchymatous keratitis in one eye; the iris was affected in some way in 15 eyes; the choroid in 12 eyes; the optic nerve and the retina in 103 eyes; there was optic neuritis in 16 eyes. The observers report in the tables all cases of eye disease of any kind that were found, whether congenital or acquired, many of which cannot be ascribed to syphilis. In the 400 eyes examined at one time there was simple iritis in 3 per cent., and in 2 per cent. more complicated iritis with chroiditis, showing a percentage of 5 per cent. Neuritis and neuro-retinitis was found to exist in 8.5 per cent. The eye muscles, in a number of cases, were found to be affected. In 79 cases of 38 eyes, 34.5 per cent., there were pathologic changes in the visual field, but in 32 per cent. these were functional, leaving 2.5 per cent. due to organic lesion. The work is well printed and has an instructive colored plate containing four fundus pictures. H. V. W.

Physiology of Visual Impressions, Vol. I.

v. KRIES, J., editor. (*Abhandlungen zur Physiologie der Gesichtsempfindungen*), aus dem physiologischen Institut zu Freiburg. B. Illustrated; 198 pp. Leopold Voss, Hamburg and Leipzig, 1897.

v. Kries has collected articles published in the Zeitschrift für Physiologie und Physiologie der Sinnesorgane, which are now published in volume form together. The theories are described under the following headings:

v. Kries: The Function of the Retinal Rods.

v. Kries and Nagel: The influence of Light Stimulus and Adaptation of the Sight of the Disachromatic (green-blind).

v. Kries: The Effect of Light Impressions of Short Duration upon the Organ of Vision.

v. Kries: Systems of Color.

Breuer: The Influence of the Macula Pigment upon Color Comparison.

It is impossible to give abstracts of this series of technical articles in these annals, or more than a passing notice. For those specially interested the original must be read. H. V. W.

The Physiology and Pathology of the Effect of Light upon the Eye.

KRIENES, H., Breslau. (*Einfluss des Lichtes auf das Auge in physiologischer und pathologischer Beziehung: Blendungskrankheiten und Blendungsschutz*). Sammlung zwangloser Abhandlungen aus dem Gebiete der Augenheilkunde; 56 pp. Karl Marhold, Halle a. S., 1897.

The author makes the following divisions of his subject:

1. *Physiologic Action.* K. explains that the metabolic action of the sun's rays upon the eye is similar to that upon the skin, and that the various fluid currents are hastened and strengthened, thus influencing processes of secretion favorably (the ciliary body and retinal pigment being the two secreting surfaces), and directly influencing their products, as in the case of the visual purple bleaching, and chemically altering them, a process of consumption called "dissimilation" (as opposed to "assimilation," the new formation of these visual substances): this, in turn, developes a new substance whose irritation is transmitted to the visual center in the brains and gives rise to the perception of light, i. e., color. Since, by limitation of the secretion, the eye can adapt itself only to definite light intensities, there arise an upper and a lower visual limit. Exhaustion of these functions within these limits, as in nyctalopia and hemeralopia, may take place in sudden changes of light exposure. Over-exertion of an organ is followed by exhaustion, but with it there is an increased supply of nourishment and withdrawal of effete matter, and this constitutes recreation of the part. Thus, in the case of the eye, the light is the factor in exhaustion and recreation.

2. *Pathologic Action.* As effects of over-exposure to strong rays the author mentions blepharospasm, corneal ulceration, iridocyclitis and retino-choroidal changes, and finds these conditions following exposure while gazing at eclipses and working in artificial light (electric: reflected light (snow and ice), lightning, and over-exposure to the moon's rays (moon-blindness) in the case of mariners, are other well-known causes. The author quotes numerous authorities on the subject of the relative frequency of disease of different parts of the eye under various exposures, and the comparative vulnerability of the various rays of light. The means of protection of the eye are stated as: 1. Surroundings and size of eye (large arcus superciliaris, nose, and deep set eye). 2. Reflex movements of lids and pupils. 3. Absorption of light rays (by pigment of iris, choroid and retina; yellow coloring of macula and of lens in old age; advance of retinal pigmentation to periphery). 4. Those arrangements tending to preserve the equilibrium between assimilation and dissimilation of the visual substances (by action of lid, movement of eyeball, and accommodation). In some individuals, and under certain conditions, the conjunctiva, cornea and iris become affected; in others, only functional disturbances of the retina of varying degree, are found.

3. The Therapy of Light and Protection against Over-Exposure to Light Rays. The author mentions the various therapeutic uses of sunlight, as in scrofulosis and skin affections, its power of purifying streams, and its bactericidal qualities. Protection against over-

exposure is attained by means of spectacles, veils and parasols. Red and yellow glass is less irritating than blue, but better than these is the English smoked glass, though the yellowish gray glasses of Fieuzal are most suitable to all cases. Veils and parasols should be red or yellow, as they prevent freckling and other changes in skin and retina due to the sun's rays(?) *Sic!* A very extensive list of references is appended. H. V. W.

Pathology of the Color Sense.

HILBERT, RICHARD, of Sensburg. *(Die Pathologie des Farbensinnes.)* Sammlung zwangloser Abhandlungen aus dem Gebiete der Augenheilkunde; 69 pp.. Karl Marhold, Halle a S., 1897.

The author gives his research concerning the pathology of the perception of color. The literature is well quoted in 194 references. He describes the subject under the following headings:

I. Irritation of the center of color vision. Pathologic color vision.

II. Paralysis of the center of color vision. Color blindness.

He divides II. into: 1. Congenital defect of the color centers; congenital color blindness. 2. Transitory paralysis of the color centers in hypnosis, epilepsy, hysteria, intermittent fever, etc. 3. Destruction of the color centers; pathologic color blindness.

Under the first head is pathologic color vision, and of this the following varieties are mentioned:

(a) Those occurring in the course of psychoses and other affections of the brain (all are nerve inflammation).

(b) Those occurring in disease of the nerve mechanism of the eye (retinal and optic nerve inflammation).

(c) Chromatic dual sense perception (color perception associated with an irritation of sound, light, smell, taste, touch, or form)

(d) Genuine chromatopia (erythropia, xantopia, chloropia, cyanopia, janthinopia).

(e) Those appearing as colored spots in the field of vision (six cases quoted).

(f) Toxic action of certain chemicals (hyoscyamus, atropin, santonin, picric acid, chromic acid, duboisin and ciliary coloring matter in icteric individuals.

(g) An anomalous reaction of the color sense center to stumulation ordinarily acting in a different manner (finding an abnormal complimentary color as an after image).

The author cites a few cases of chromatophobia, and concludes this part with the following deductions:

1. Pathological color impressions as always subjective.

2. They are of central origin and caused by irritation of the center of color vision.

3. External influences cannot excite, but merely exaggerate them.

II. Paralysis of the center of color vision is subdivided as follows:

1. Congenital color blindness.
   (a) Total color blindness (individuals who can distinguish only white, black and gray).
   (b) Partial color blindness (red-green and blue-yellow).
2. Transitory color blindness is observed in:
   (a) Traumata.
   (b) Action of toxic agents and organisms (alcohol, tobacco, lead, etc.; plasmodium material.
   (c) Nervous individuals (hypnosis).
   (d) Cases of exposure to strong light.
3. Destruction of the center of color vision (pathologic color vision (pathologic color blindness has been observed in):
   (a) Traumata of brain, both from external agencies and from injury from central apoplexy.
   (b) Later course of atrophy of optic nerve (genuine atrophy and in retinitis pigmentosa).
   (c) Beginning of general paresis.
   (d) Tumors of optic nerve.

(e) One-sided, in a case of foreign body penetrating the eyeball.

(f) Acromegaly.

The author concludes with an interesting account of the theories of color perception. H. V. W.

Convergent Strabismus and Its Treatment.

HOLTHOUSE, EDWIN, M. A., F. R. C. S., Surgeon to the Western Ophthalmic Hospital. J. & A. Churchill, London, 1897; P. Blakiston, Son & Co., Philadelphia; 8 vo,, 177 pp.

Never, in all medical literature, have I seen a more brilliant use of statistics, nor a more critical analysis of the results derived from them, than that which is given in the book before me. Perhaps its title is misleading, in that the subject is not a systematic treatise of squint, beginning with a definition, proceeding through etiology, symptomotology, diagnosis, and ending with treatment; but rather is it really an essay on the more abstract considerations of strabismus and the results of treatment, taking it for granted that the pages are read by the advanced student of ophthalmology, and that the traditional knowledge to be found in elementary text books is well mastered beforehand.

In fact, the whole book is a study in mere statistics, by the use of which the author seeks to prove or to disprove certain new or old theories as to cause, and as to results of treatment. A goodly number, 144, of cases of squint of unmixed character (by this he excludes those due to corneal nebulæ), are used for purposes of analysis, from which the author constructs 53 tables, so arranged that the subject may be studied from every point of view; there are subdivisions into monolateral convergent squint, alternating convergent squint; tables comparing the refraction of the two eyes, of the meridians in the two eyes, of the visual acuity in the two eyes; tables of the age at which squint began, of the visual effect of glasses, of their influence on lessening the angle of convergence (measured on the perimeter), of the consequences of operation. And the conclusions formed are all derived from the study of these tables alone, without any theorizing thrown in. Some of the conclusions merely tend to support classical opinion as to the causes of squint; others, if they do not upset generally accepted views, do most certainly throw grave doubt upon the complacent statements of some textbook writers. For instance, it is shown that heredity is at work in most cases where squint began early in life; that anisometropia is by no means the sole factor in determining squint, or in deciding which eye shall fix; and that "the squinting eyes are inferior to the fixing eyes in that:

"1. Simple hypermetropia is less common among them, and the lower degrees thereof occur less often;

"2. Astigmatism is not only more common, but the higher degrees thereof occur more often among them."

Again, it is shown by one table that "the sight of the squinting eyes was not made worse by the longer duration of the squint:" and by others that "the amblyopia of strabismus is not developed by a long-continued habit of 'suppression,' but is a primary congenital defect."

In speaking of alternating strabismus the author states that "it is clear, therefore, that not only is there little refractive difference, as a rule, between the eyes of one suffering from alternating strabismus, but that in most of those so affected the total refractive defect is of but inconsiderable extent."

The nervous disorders of childhood, especially those during dentition, are given more weight than usual, while at the same time congenital abnormalities of the eyes themselves must be an essential factor. The methodical use of glasses is found to do substantial good in all but a few cases. Observation on a series of unselected cases gives no support to the view that old-standing convergence brings about organic changes in the muscles of the deviating eye that must seriously hinder recovery by any other means than operation.

I do not presume to say that the few illustrations I have quoted are the most important in the book, neither have I at my command elaborate evidence of any other character with which to prove, or to disprove, the author's conclusions, even if I so wished. I am by no means convinced by all his tables, nor do I see that he makes great effort to convince me. The whole book is a fascinating study of statistics, as I said before, and one which every student of the complex problem of strabismus can well afford to read, especially if he had hitherto held the subject simple, or well understood since the time of Graefe. I have been disappointed at finding no description of the technique of either the application of glasses or of operation, for my own experience teaches me that the character of the spectacle frame, as well as the lens, influences squint and vision too, while much can be done in a purely cosmetic sense by a poorly executed or a delicate operation. Moreover, the subject of the influence of binocular fusion by stereoscopic images is neglected—a mistake, I think, because the author mentions such treatment, and even quotes Landolt, who has done so much in France to encourage perseverance in efforts to improve the amblyopic eye.

The mechanical and typographical work in the book is splendid. I wish all publishers and authors would take sufficient pride to give us such good paper, type, ink and margin: and if I saw any error, I shall not notice it, because it was a rarity, and in only *one case* (see p. 153), could the mind be jostled for a moment by wondering what the author meant. A. B. H.

A Treatise on Diseases of the Eye.

(Traité de Thérapeutique Appliquèe, publié sous la Direction de l'Academie de Medicine. Specialtés. Traitement des Maladies des Yeux par MM. Ph. Panas, E. Valude, H. Parinaud, E. Kalt, A. Chevallereau, Paris, 1897.)

Since the appearance of de Wecker's Ocular Therapeutics no monograph or treatise on the treatment of diseases of the eyes has been published that is comparable to the one before us. It is the ophthalmic section of the practical system of therapeutics issued in several volumes, each complete in itself, and edited by Albert Robin. It is both comprehensive in that it comprises all ocular diseases, anomalies of muscular equilibrium and refraction, and detailed, in its minute description of the many forms of disease and of the applicability of the numerous and varied remedies. The great difficulty of writing an acceptable book on the therapeutics of the eye, namely, that of repetition and tacit acknowledgement that many diseases are not amenable to treatment, has been avoided with consummate skill. The authors are masters of their subjects, and have formed opinions from a thorough up-to-date acquaintance with the literature, and from their own vast experience in experimental and clinical research. Their French is simple, elegant, and easily comprehensible by the average scholar.

Perhaps the truest and most satisfactory conception of the scope of the work and of its practical value can be obtained by an enumeration and partial analysis of the subjects discussed respectively by the five authors. Panas treats in a 21-page introductory of the pathology and general therapeutics included under the three heads of surgical, medical and mechanical, His statement that the surgical division holds undisputed first place is in harmony with the opinions of continental surgeons, but will meet with considerable opposition from American oculists, who have labored long and earnestly in the field of mechanical therapeutics, and who have demonstrated beyond preadventure, not only that patients with errors of refraction and muscular anomalies constitute more than one-half of the whole number of persons seeking treatment, but also, that the correction of such defects is the only scientific method of curing their ailments. In the treatment of paralysis of the muscles it would be well if Panas' observations, page 9, were strictly followed; that tenotomy or muscular advancement is not indicated until after the cure of the paralysis, and then only in cases of retraction of the antagonistic muscle. Within the past year or two the operative treatment has been practiced by a few eminent surgeons, but such a procedure has no justification and should be discountenanced. Panas' observations on non-paralytic deviations are admirable. He says that after nine years of age, it is useless to expect ametropic corrections to effect a cure, and operation should be resorted to without further delay, but the result of operation is aided by appropriate glasses and by orthroptic exercises undertaken with the view of re-establishing the physiologic play of the muscles. He lays great stress upon the function of the higher centers and innervation of the muscles in the causation of squint. The center of co-ordination, of which the function is uncertain and rudimentary at birth, perfects itself rapidly to satisfy the needs of binocular vision. This explains why ametropes, anisometropes and amblyopes are infinitely more subject to strabismus than emmetropes, and persons with normal acuity of vision. It explains also the etiologic role of the nervous system and of heredity. Concerning the much discussed question of auto-intòxication, he sides with those who believe that many diseases, particularly those of the uveal tract, are toxic in origin, arising from unsuspected causes, such as endometritis, and constitutional affections, gout, scrofula, diabetes and albuminuria. Of the general anesthetics, he prefers chloroform; of the local, cocain. Eucain and holocäin, the popular new anesthetics, are not mentioned.

Valude occupies 45 pages in the consideration, classification and treatment of diseases and deformities of the lids, 12 in those of the lachrymal apparatus, and 10 in the affections of the orbit. Space is wanting to review or criticise in detail the recommendations of treatment of the various subjects. With the exception of enophthalmus, which is omitted from the list of the orbital affections, the chapter is complete but without novel suggestions.

Parinaud considers in 27 pages the causes and results of treatment of strabismus. Among the several causes he mentions the nervous affections of early infancy, such as convulsions hereditary vice of development manifested by imperfect aptitude of binocular fixation; as ocular causes, errors of refraction, loss of acuity of vision, unequal vision of the two eyes, retraction of fibrous aponeuroses and secondary modification of the muscles. In the treatment, steroscopic and prism exercises are more useful in the convergent than in the divergent variety, as are also, atropin and correction by glasses. He recommends trial by these methods for several months, and in cases of failure, tenotomy or advancement in convergence and advancement only in divergence.

To diseases of the conjunctiva, cornea, sclera, iris and lens, Kalt devotes 89 pages. For the ordinary forms of catarrhal conjunctivitis the usual astringents and cauteries are recommended. While giving due weight to the classic use of nitrate of silver in the purulent form, he has obtained the best results when this remedy was used in conjunction with irrigation with potassium permanganate. In pseudo-membranous conjunctivitis, he recommends heat and irrigation, and cautions against silver; in diphtheric, the antitoxin serum; for corneal ulcers and abscesses, subconjunctival injections of sublimat or cyanid, applications of methyl blue, iodin and glycerin, tincture iodin and the galvano-cautery; for scleritis, the alkalies, salicylates and strychnia, colchicum, hypodermic injections of pilocarpin and hot applications; for iritis, the usual remedies. In extraction of uncomplicated cataract he prefers the simple operation, reserving the combined for cases complicated with synechia, hernia of iris, and for immature and dislocated cataracts. Many experienced operators will not concur in his opinion, that the combined offers no advantage over the simple procedure.

Diseases of the posterior portion of the eye, refraction, glaucoma and paralysis, are discussed by Chavellereau in 226 pages. The diseases are taken up in their order as suggested by the anatomic arrangement of the tissues involved. In hyalitis, he advises subconjunctival injections of mercury cyanid, mercurial inunctions, hypodermics of pilocarpin, potassium iodide; for the different forms of choroiditis, repose, dark glasses, leeches, potassium iodid, mercury, pilocarpin, thermo-cautery, subconjunctival injections, tonics. The chapter on refraction is interesting and practical, and his plan of examination and correction in accord with that of the best ophthalmic surgeons. In the discussion of the treatment of glaucoma, prominence is given to the use of eserin and pilocarpin. In simple glaucoma no operation is advisable, but in the inflammatory forms he practices iridectomy and anterior and posterior sclerotomy. In the management of paralysis, the cause must be ascertained whenever possible, and medication adopted accordingly. As accessories, he advises prism exercise and the constant current. Muscular advancement or tenotomy are admissible only in old cases not amenable to cure. HANSELL.

Eye Strain in Health and Disease with Special Reference to the Amelioration or Cure of Chronic Nervous Derangement Without the Aid of Drugs.

RANNEY, DR. L. AMBROSE. The F. A. Davis Co., 1897.

A volume comprising the substance of several monographs that the author has published from time to time during the past ten years, with the addition of considerable new matter, all of which is aimed at the general practitioner. For this reason the work ought to be extensively reviewed in the general medical press, that the profession at large might have the verdict of trained workers in Dr. Ranney's own specialty as to the value of his labors and the weight of his conclusions. The author's name is sufficiently identified with this line of work to serve as an introduction to the volume; indeed, it is sufficiently well known to embarass the reviewer somewhat in recording his impressions concerning a volume that reads more like a novel than anything he ever encountered in medicine. Dr. Ranney has the rare faculty of arraying medical facts in a fetching fashion, and may be this is why some one has pronounced the book a dangerous one, which it certainly will be in the hands of the inexperienced, but to the trained mind his facts would be unpalatable without a goodly grain of salt.

Any means or measure, or system of means and measures, that will add to the span of human life by lessening nervous debility and the diseases it entails will be eagerly sought after by the profession at large, hence Dr. Ranney, in claiming this result for his labors, is assured of a large circle of readers. But, as was said on a notable occasion many centuries ago, "the truth shall set ye free," and the question returns as quickly now as it did then, "what is truth?" Medical truth is born of facts growing out of scientifically conducted studies, which facts must at all times under the same given conditions be susceptible of demonstration by exactly similarly conducted studies. In the volume before us the author announces as a *truth*, the doctrine that the eye treatment alone—independent of drugs—of many functional neuroses, viz., chronic headache, neuralgia, chorea, insomnia, chronic functional gastritis, and epilepsy, suffices to effect a cure in most cases, said cure hinging (in nearly all the cases reported) upon tenotomy of one or more of the ocular muscles in addition to the use of correcting glasses. Histories of 122 cases are submitted as follows:

Headache and neuralgia, 50 cases, of which 25 were cured; 19 were benefitted, and 6 were not benefitted.

Thus the percentage of recoveries in this series of cases does not seem to exceed that of those workers who combat headaches and neuralgia with close correction of the ametropia combined with orthoptic exercises and the wear of prisms. It is worthy of remark that one of these headache cases was pronounced by Dr. G. T. Elliott, of New York, as "typical diabetic headache." "Without any drugs, the sugar in his urine was reduced to one-half of one per cent. within a few weeks by the relief of abnormal muscular tension in the orbit. The neuralgic attacks were totally arrested for a time." But how often does this phenomena occur in diabetes independent of whatsoever eye or drug treatment? Surely this case does not lend much support to Dr, Ranney's contention.

In the succeeding chapters the following conditions are considered. Chorea, 14 cases, (12 cured, 2 improved;) insomnia, 11 cases, (10 cured, 1 improved;) chronic gastric disorders, 6 cases, and nervous prostration, 14 cases, all cured. But the most interesting statistics submitted are those referring to epilepsy, in 26 cases of which disorder the author claims to have affected a cure in 7, and to have brought about vast improvement in 12 more without the aid of drugs; 3 were not improved, and the remaining 4 abandoned treatment after the first consultation. The duration of the treatment is from six months to two years. These statistics are unusual enough to demand proof by an extended series of control observations and investigations by different workers who are willing to approach the subject in a spirit of fair mindedness and to conduct their studies along exactly the same lines as has Dr. Ranney. At the present time, the most that can be said of the volume, is that the principles therein proclaimed stand as *not proven by any one but Dr. Ranney himself*. When his statistics on epilepsy are proven or disproven, the real worth of his volume will be easy to estimate.

The two noteworthy features in his treatment of all the above neuroses are: 1. That he either unearths what is a latent heterophoria or develops what is a fictitious heterophoria. 2. That said heterophoria is met, in perhaps 90 per cent. of his cases, by operative procedure rather than by prismatic exercise of the weak muscles or the regular wear of prisms. It is evident that the author has not much faith in prisms for regular wear, as mention is made of this means in only one case, The gymnastic use of prisms, a method that is gaining advocates rapidly by reason of its efficiency, is not anywhere referred to. The author's main use of prisms seems to be for what he terms the uncovering of latent heterophoria. Moreover, there is a surprising preponderance of esophorias over exophorias in his statistics, a finding which we believe will be hard to confirm in 100 consecutive cases in any oculist's office in this day and generation, if the final diagnosis be made to rest on the Maddox test, the phorometer, the parallax test, and estimation of the musculo-dynamics.

It would be interesting to know why the author gives the preference to tenotomy over advancement; probably because the former can be relied upon for greater precision of result. Unfortunately, as Landolt has pointed out, tenotomy allows the globe to slip farther out of the grasp of the external ocular musculature. Advancement certainly seems the more rational method.

So much for the volume in detail.

The introduction into the volume of testimonials from patients is greatly to be deplored. On page 115 is found the following letter: "You ask what I think of Miss L's. improvement? It is little short of miraculous." Again at page 144, from a grateful patient: "Your name will occupy a prominent place in our shrine, and Heaven will be continually beseiged to bless you and yours." Such things are sacred, and such use of them compels even him who would draw the veil of charity to wonder whether "the meek really shall inherit the earth?"

It may be said of this author, as has been said of another, that although he may not always be right, yet he is extremely interesting, and although the volume may not fulfill the author's purpose, it will however, prove useful in awakening new trains of thought and stimulating labors in a field where the harvest is great but the laborers few. W. R.

A Comparative Study of the Area of Acute Vision in Vertebrates.

SLONAKER, JAMES ROLLIN, Ph. D. (Ginn & Co, The Athenaeum

Press, 1897, 58 pp. Reprinted from the *Journal of Morphology*, XII., 3.)

This is one of the most important contributions to comparative ophthalmology that has appeared for some time. The attempt to postulate the kind and amount of visual perception in the lower animals from the anatomical arrangement and relations of nerve head, area (macula lutea), pecten, etc., can only be partially successful because we are, so far, quite in the dark as to the function or functions of these organs. Dr. Slonaker's thesis marks, however, an appreciable advance in the physiology of the subject. After discussing the visual area from a historical standpoint, and describing his methods of examination, he proceeds to the morphology of the retina as presented in various members of the vertebratae. Slonaker finds among them a great variety in fovea and area, many beautifully represented in plates appended to this work. He has examined 18 different mammals, 41 birds, 6 reptiles, 3 amphibians, and 25 fishes.

The fovea especially is found to present a variety of forms and positions. "In depth it may vary from the very shallow depression found in the guinea hen to the very deep pit in the crow or hawk. It has also been found to vary in the same species, but this may be due to slight swelling produced in hardening. In size it varies from the very broad fovea in the human to the exceedingly sharp depression in the sparrow hawk (fovea nasalis) and the horned toad. Chievitz claims that certain animals have also a trough-like fovea, such as the tern, etc. I have not been able to procure any of the species which he describes as having a "trough-like" fovea, but have succeeded in obtaining a species from the same genus, *sterna*.

The relation of the fovea correspond to the positions above described for the area. That is, we find a *fovea nasalis*, as in the crow, bluejay, robin, snowbird, etc., and a *fovea temporalis*, as in man, the gorilla, owl, tern, hawk, etc. One or two foveæ may be present, but in each case where two are present, the nasal fovea is always deeper than the temporal.

A very noticeable and important difference in the position of the fovea in various birds has been observed. Very little variation is found in the position of the fovea nasalis, but the location of the fovea temporalis depends wholly upon the position of the eye in the head. As the eyes are turned more and more forward, the fovea temporalis approaches the nasalis and as binocular vision becomes more frequent, the nasal fovea becomes less distinct, or merges into the temporal. The change to an asymmetrical form, and the position of the lens in the eyes of the birds which possess the power of binocular vision, is also quite marked. In many of these birds, as the tern and white-bellied swallow, where the fovea nasalis is sharp and deep, and the fovea temporalis quite shallow, the eyes are almost symmetrical. But in those birds which use binocular vision as shown by a greater depth of the temporal fovea, as in the hawk, the eye becomes more asymmetrical, and finally reaches the most irregular form in the owl, where binocular vision only occurs.

Various combinations of area and fovea are found in different animals. The most simple is a single fovea surrounded by a circular area, as in the primates and most birds. Again we find a simple fovea surrounded by a round area which is continuous with a band-like area extending horizontally across the retina, as in the goose and ring-necked plover. One or two foveæ may be present, each surrounded by a round area and connected by a short, slight, band-like area in the sparrow-hawk, red-tailed buzzard, and kingfisher. The most complex combination which I have found is in the tern. Here the fovea temporalis, surrounded by a small round area, is not connected with the band-like area which extends horizontally across the retina, and near its middle widens out into a round area surrounding the fovea nasalis."

The essayist's experiments to determine the visual acuity of the animals examined were not very satisfactory, as these experiments rarely are, and it might be suggested to him that he has ignored the condition of the refraction, obtainable in toto by skiascopy, as furnishing a valuable hint in such investigations. Murdock, of Baltimore, and Lindsay Johnston, of London, have made noteworthy observations in this direction. Both of these observers have succeeded in employing the portable ophthalmometer in measuring the curves of the cornea, and have found that certain fixed relations exist between the contour of the cornea, shape and size of the iris and lens and the probable visual acuity.

The work done by Dr. Slonaker is the sort that needs encouragement here and elsewhere. and it is a relief to read such productions as a change from contemplating the entirely human aspects of ophthalmology. C. A. W.

A Compend of Diseases of the Eye and Refraction, Including Treatment and Surgery.

Gould, George M., A. M. M. D., and Pyle, Walter L., A. M. M. D., Philadelphia. P. Blakiston & Co., Philadelphia.

Is a neat little book of 258 pages, including an index of six pages, and an eight page Glossary of ophthalmologic terms. The illustrations, of which there are 111, and colored frontispiece showing scheme of optic tracts, are splendid cuts and together the text illustrates what so many of the more comprehensive volumes lack; *i. e.*, the manner in which examinations, operations, etc., are conducted, which to many, especially students, for whom the book is designed, is a greater advantage than the description.

Part I.—includes a general description of the eye. Elementary optics. Optical considerations of the eye, under which the refracting surfaces, principal points, accommodation, hyperopia, myopia and astigmatism, are tersely defined and accurately described. To the examination of the eye 62 pages are devoted, and a more comprehensive resumé can not be found; every word of the text counts and is especially devised for students, starting with manner of keeping a record, the questions to ask, etc., simple inspection, oblique examination and conditions found. The ophthalmoscope is described and manner of using. James Thornington's paper on retinoscopy needs no comment here, it being too well known. Test cards and test lenses receive their due consideration, mydriatics and cycloplegics, ametropia, and the instruments used in the objective examinations, are all thoroughly described and their use explained. Amblyopia amanrosis and their causes are defined and conditions found described. Ocular muscles, anatomy, functional anomalies, their determination and methods used, strabismus and operative measures, conclude part I.

Part II.—Takes up diseases of the eye. Disease of the eyelids, lachrymal apparatus, conjunctiva, cornea, sclera, iris and ciliary body, choroid, retina, optic nerve, lens, vitreous, orbit, their definitions, varieties, treatment and operative measures necessary, are briefly but comprehensively explained and fully illustrated. Glaucoma, injuries to the eyeball and local ocular therapeutics conclude the most comprehensive treatise for students and general practitioners in ophthalmic literature, and could be perused with advantage by very many whose "practice is limited." N. M. B.

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